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JUL 17 1922


# Electrical World

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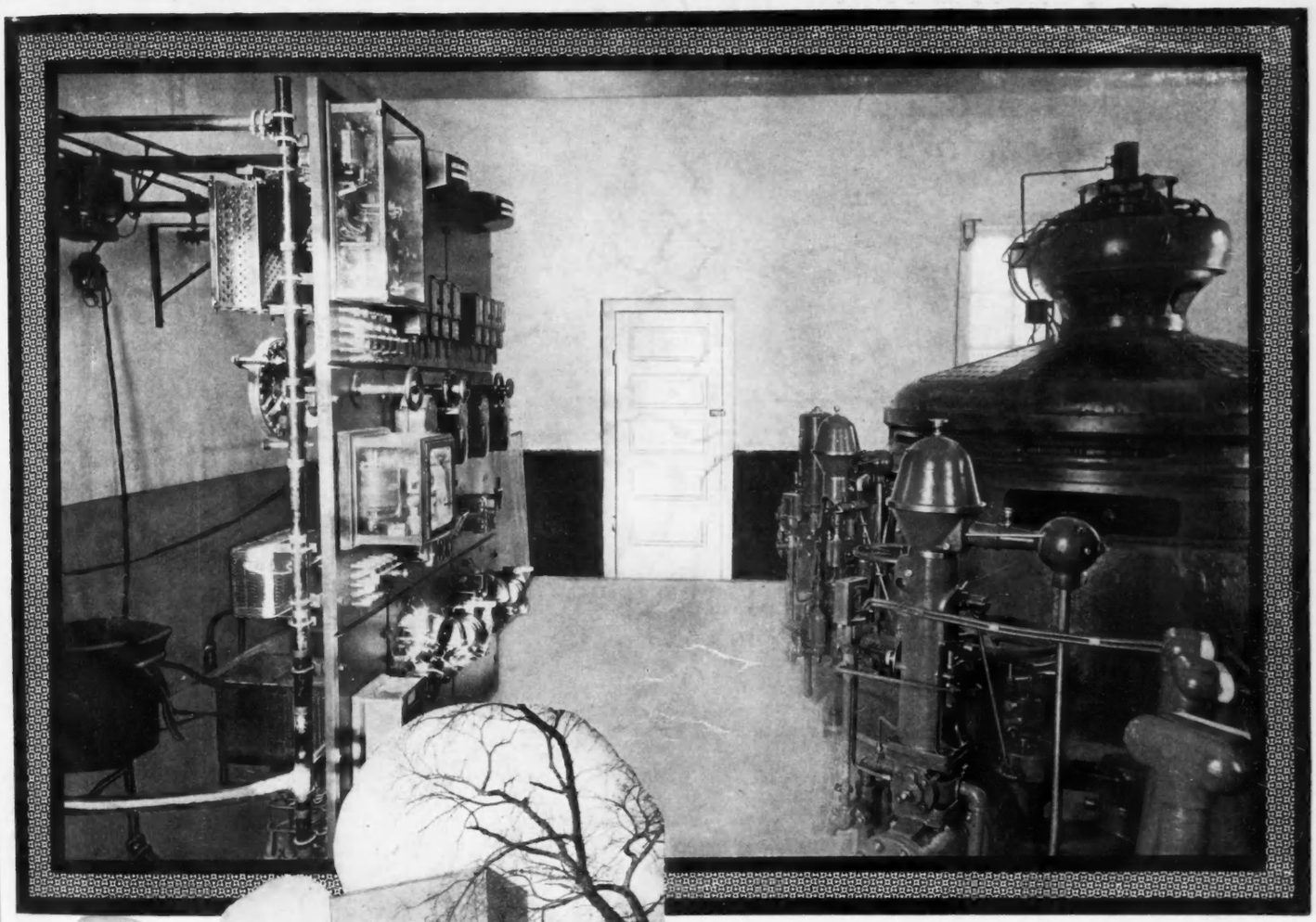


This plant of the Fairbury Mill & Elevator Company at Fairbury, Neb., is equipped with 2 G. E., 150-kva., 2300-volt,. 180-r.p.m. generators, and full automatic control.

The Woodward Governors have solenoid control for automatically starting or stopping the turbines.

The device is designed to work with the electrical apparatus, giving the correct starting time required for the automatic switches to bring the generator on the line.

The development of hydro-electric power here is made possible by automatic control, for otherwise the expense of attendance would outweigh the benefits.

This plant is owned by the Fairbury Mill & Elevator Co. and replaces a rope drive from an old overshot wheel. The mill has been entirely electrified and, through interconnection with the municipal steam plant, full use of water power is obtained. A reciprocal contract allows the hydro plant to furnish power for water works and lighting at less cost than steam power, and enables the mill to buy when the water is low.


**Woodward Governor Co.**
Rockford, Illinois

*The* WOODWARD *OIL PRESSURE* GOVERNOR

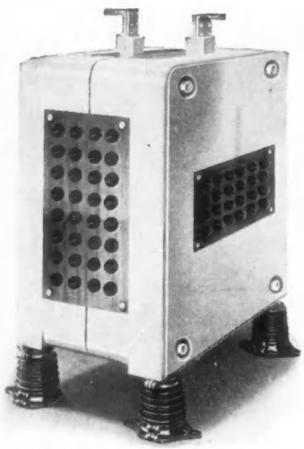
# Hell Gate Station

The largest power plant in the world has installed

## Metropolitan Reactors

as standard equipment throughout

Outdoor Service Reactance Coils, 25 to 250 Amp.



Indoor Service Reactance Coils, 25 to 350 Amp.

# Short Circuits

in your system cannot be prevented—as yet!

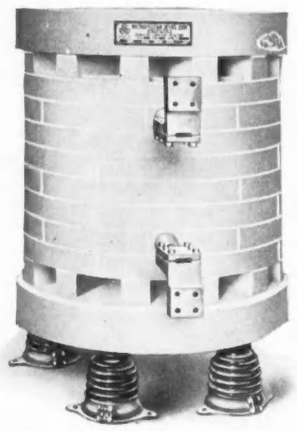
Do the next best thing, protect your equipment from abnormal and dangerous stresses.

## Install Metropolitan Current Limiting Reactors

and have

maximum { short circuit protection, reactance, efficiency

minimum { energy losses, space requirement, temperature rise



Indoor Service Reactance Coils, 350 to 750 Amp.

Indoor Service Reactance Coils, 750 to 3000 Amp.

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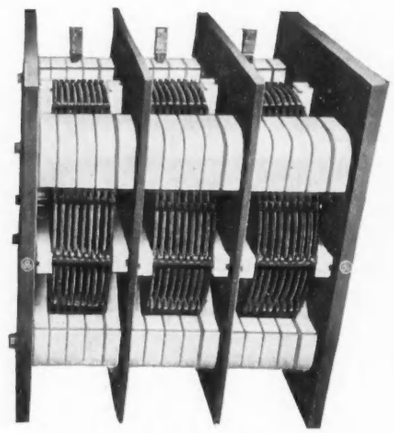
1250 Atlantic Avenue
Brooklyn, N. Y.



Three-phase Feeder Reactance Coil

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Gentlemen: Please send data and full information on current-limiting reactors.

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# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

Published by McGraw-Hill Company, Inc.

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*Volume* 80 — New York, Saturday, July 15, 1922 — *Number* 3


# *A Purpose for Us All*

TO EVERY electrical man Charles A. Coffin's vision of the future of the electrical industry is a matter of interest. Forty years ago this man turned from shoe manufacturing in Lynn to the electrical business. As head of the General Electric Company he has inspired and guided the most spectacular achievement in commercial history. For he has been the great upstanding leader in our industry through all these years of its development.

Upon his recent retirement as chairman of the board Mr. Coffin gave an interview to the New York *World*. In it he pictured his vision of the part that electricity will play in future years.

"THE next big social change, as I see it," he said, "will be decentralization. Electricity made the big city. It may now be expected to unmake it."

He then went on to explain how the massing of men in cities where power and labor were at hand made our great industrial development possible. But the expanding progress of electricity is now bringing power to all men, in the villages and on the farms. This "broadcasting of power" will gradually make it possible to manufacture our raw materials close to the source and obviate the necessity of transporting them first to the distant city factory and then in the manufactured state back to the markets.

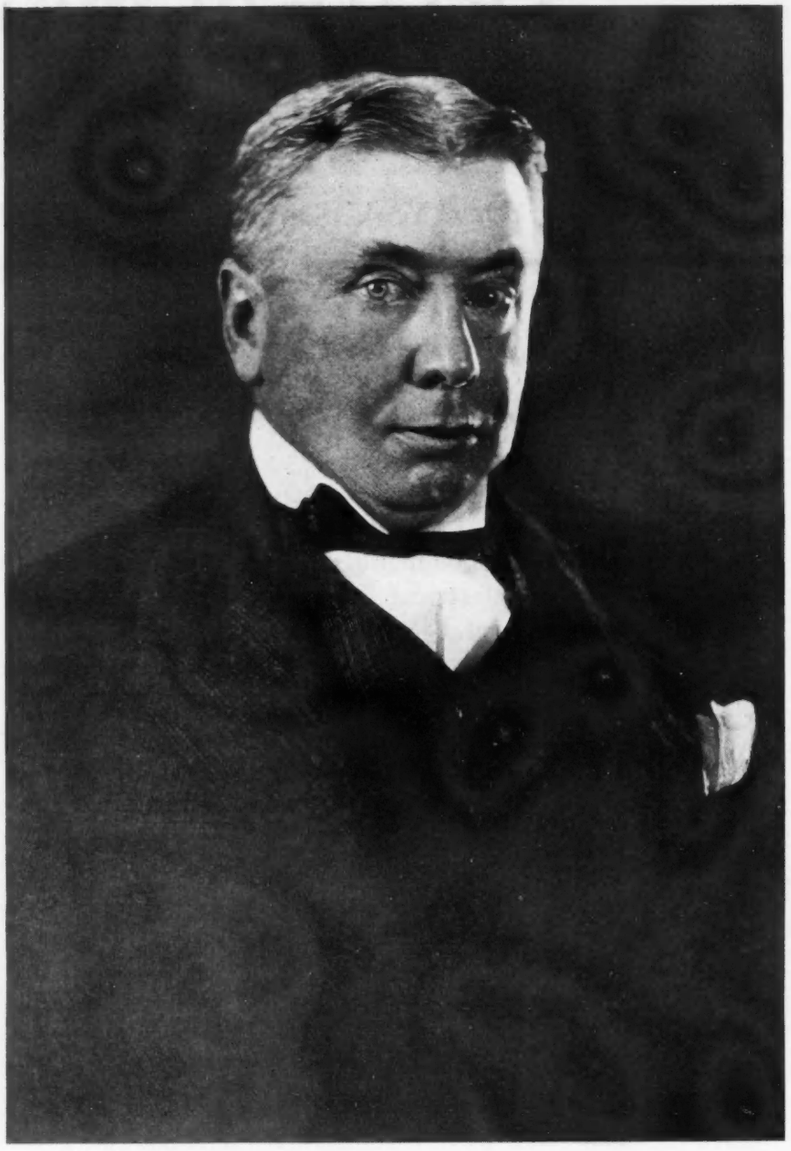
For food can be eaten more economically out in the country where it is produced. Fabrics should be woven where the cotton, flax and wool are grown. Coal should be burned and ores converted into articles of commerce close to the mines. All this will be possible when labor is distributed out through the open country. And Mr. Coffin believes this will come through the extension of great superpower systems and the establishment of small electrically driven factories in all communities adequate for the utilization of all the natural resources of the section.

AT PRESENT 51.4 per cent of America's population live in the city, and this is the source of most of our social and economic troubles. Strikes, non-employment, intermittent occupation, crime waves, high prices are all products of urban congestion. The city has almost destroyed the home, but it has brought other advantages which modern man will not do without.

Electricity is now going to make it possible to carry these comforts, amusements, occupations and opportunities out from the city into the clear air and healthful spaces of the country, and life there will be no longer difficult or solitary. We electrical men of today must make this a purpose. Here is our great opportunity for service and for achievement, our common broad road to prosperity.

# Alfred Edward Newton

*Chief executive of an electrical manufacturing enterprise of international fame and an author and essayist of distinction.*



MOST of the active chief executives of the more important manufacturing companies in the electrical industry are recognized and spoken of as electrical men. They are known widely to their contemporaries in the industry and have had a considerable contact with their customers. Occasionally, however, we find a man at the head of some eminently successful company who has been interested not in the industry but by an idea embodied in a business, and has so focused his attention and his energies upon the purpose of that business that he has brought his company and his product to a point where they enjoy an international reputation, while he himself remains almost unknown in his own business world.

Such a man is A. Edward Newton, for twenty-seven years directing head of The Cutter Company of Philadelphia. He is an author and essayist of note wherever men read current English literature. As a collector and an authority on old books his name is as familiar in London as in New York or Philadelphia. But few men realize that his chief concern during the larger part of the life of the electrical industry has been the development and perfection of electrical control apparatus—notably the circuit breaker.

When Mr. Newton displaced the sheriff as the financial manager of The Cutter Company in 1895, that pioneer producer of automatic electric cut-outs was reduced to financial extremities through the vicissitudes of the development period, as was unhappily too often the case. Mr. Newton was not an electrical man and, in fact, does not consider himself one today. But he was attracted by the apparent commercial possibilities in this new idea of automatic protection for electric circuits and equipment by a self-acting cut-out switch. He staked all the money he had and more on the success of the idea and as treasurer gradually lifted the company out of the slough and established its financial credit—and succeeded to the presidency.

The mechanical and electrical perfection of the Cutter product is due in no small measure to Mr. Newton's ability to surround himself with keen and capable technical assistants and then not interfere. Meanwhile, with keen business perception and capability, he has guided the commercial promotion of the idea of automatic protection which has been his chief interest from the first.

As an avocation he chose that of a man of letters and there has found delight and recreation. His welcome to the roll of *Atlantic Monthly* contributors attests the quality of his work. He is the author of two volumes, "The Amenities of Book Collecting" and "The Magnificent Farce," and a large number of other essays, including an introduction to the Gutenberg Bible. Bound up with this introduction, single leaves of one of these priceless treasures—from a mutilated volume of the original edition—are now being made available to libraries and book lovers. Mr. Newton has gathered together a collection of old books which contains many of the most notable landmarks of English literature in first editions and is especially rich in early printing.

Mr. Newton is now in his sixtieth year. Like so many other men who have achieved distinction, he is largely self-educated. He began his business career when only fifteen years of age. He lives a somewhat retired life on his large country place at Daylesford, Pa.

# Editorial Comment

Electrical World, July 15, 1922

Volume 80 Number 3

### Keep the Market Stable and Encourage Resales

THE investment pendulum has swung in the direction of utility securities, particularly those of electric light and power companies. Before and during the war the investing public regarded them with indifference, but during the last year a very active market has been available. Public service commissions have established a regulatory basis that encourages capital investment in such securities, and the after-war financial slump was confined largely to manufacturing, so that utility credit is good.

Investors realize now that light, heat and power are stable necessities supplied by companies that are regulated by law to such an extent that they rank with banks as safe enterprises. Another element entering into the matter is that radio, domestic appliances and many new inventions and developments have popularized electricity and at the same time have increased utility revenues.

The point in connection with present conditions is that this stable market must be maintained by the utilities. Dividends or interest payments should not be suspended or jeopardized. Resale of securities should be encouraged so as to take advantage of favorable discounts and interest rates.

The public and regulatory bodies should be still further educated to a proper realization of utility finance. Financing from stock sales is the same as cash advanced by the utility and should be so regarded in rate schedules. Stock sales are legitimate sources of money and should be encouraged.

### A Safe Way to Meet an Emergency

ONE of the great trunk line railroads of the country at least has been obliged to withdraw twenty-three daily trains because of coal shortage. Other railroads have dropped many more trains from their daily schedules, but whether the withdrawals are due to the strike of the shopmen or to lack of coal is not stated. Railroads have been known to seize coal in transit on their lines for their own use in emergencies, but if no coal is moving empty bins cannot be replenished in that way.

In sharp contrast to this abridgment of railroad service is the 100 per cent service being rendered by the electric light and power companies of the country. Anticipating a coal strike, which is not a difficult matter seeing that miners' wage agreements expire at a definite time, the electric light and power companies many months ago began to accumulate and store coal. This is always an economic and wise policy to pursue in threatened strikes because coal can always be used, and the loss through deterioration is nothing compared to the loss of prestige and revenue due to a curtailment of service for want of it.

Typical of the central-station attitude is the spirit shown by the Westchester Lighting Company. It foresaw last October what is happening today. It took the initiative. It displayed resourcefulness and decided to act immediately. By mortgaging itself heavily it obtained enough coal to keep running until next January. Not all electric light and power companies were in a position to secure or purchase that much coal, but all laid by a generous supply. Sagacity has always been required in electric public utility work. Stations and lines must be built in advance of the demand and in providing fuel to tide them over a strike period the electric light and power companies of the country are running true to form. Foresight, not hindsight, is the watchword.

### Advertising Space Should Be Purchased on a Value Basis

OCCASIONALLY some one gets up in a utility convention for a talk on advertising which can be reduced to the statement that newspaper space should be used to keep the editor's mouth shut. A case of this kind occurred in a recent central station convention when an operator told of his method of using advertising space and distributing job printing. It was to use advertising space in the papers of each community served and distribute the job printing in the community in which it was to be used to the papers of that community, and, last but not least, never to question any price that was charged for the advertising or job printing service.

It is regrettable that there are men in the utility business who cling to the belief that any newspaper whose support is of value can be bought in such a way as this. A community newspaper is of value for advertising purposes only as it wields influence based on its standing. To achieve a standing worth while the editor must face and discharge responsibilities that are as great as those of any other citizen. Such an achievement must have a foundation of honesty of purpose that will not permit him to be influenced by such petty suggestions as that made by the utility man referred to above. Being influenced by this sort of thing is the editor's surest road to oblivion.

Advertising space in the local newspaper is a commodity that should be purchased strictly for its value in reaching the people to whom the utility operator wants to talk. Job printing is another commodity that has a real value on which it should be purchased. The average small city or town paper owner is operating, like all the business men of such communities, on a cost basis that may not permit him to compete dollar for dollar with the great city printing establishments, and is entitled to consideration of that fact in negotiations with him for any commodity that he has to sell. The utility operator should purchase his wares on the same basis he buys any other service he needs in his

business, and that without regard to whether editorial opinions are agreeable or not. In fact, editorial opinions that disagree with the utility man's viewpoint may indicate a class of readers that it is important to reach. The medium may be all the more valuable from an advertising standpoint because that class of readers can be reached in no other way than by a well-worked-out advertising policy based on the use of such papers. It will be easy to weed out the very small number of papers whose editorial policy is basically dishonest and keep clear of them in the same manner that good policy dictates keeping clear of any business man who is found to be dishonest.

### Tertiary Winding on Main Transformers for Line-Control Apparatus

THE favorite solution for the regulation problem on long-distance transmission lines is to use a synchronous condenser at the load end. While this affords a cheap means of accomplishing the desired result, a practical difficulty arises out of the fact that it is difficult to design rotating machines for the logical and most economical step-down voltage of high-tension transmission lines.

To obviate this difficulty it has been suggested that the step-down transformers be equipped with a tertiary winding having a voltage which is applicable to the synchronous condenser. This arrangement should permit of a saving in transformer costs. Furthermore, by connecting the tertiary winding in delta and the main windings in star, the tertiary winding can supply a third harmonic exciting current to the transformer bank and a grounded neutral can be used, if desired, on the secondary of the main winding.

Operating data on this type of installation are eagerly awaited by a number of companies which do not feel that any entirely satisfactory solution to the problem of line regulation has yet been presented.

### Reactor Arrangements—A Problem Economic as Well as Technical

IN THE early days the insertion of reactance in circuits to limit or localize the results of a short circuit was avoided because of its effect on voltage regulation. But with the improvement of load power factors and the development of automatic voltage control this objection has lost much of its importance. In fact, generators and transformers are now intentionally designed with high inherent reactance so as to contribute a part of the total protection necessary. The problem was relatively simple while station capacities were still small, the usual arrangement being a reactor in series with each outgoing feeder. However, with the modern central station of large units and of total capacity continually in advance of the ratings of standard equipment, it has been found increasingly important to sectionalize the buses, with reactances between sections, so that local feeder or station trouble may not endanger the entire system.

As a consequence the design of reactance coils for specific duties is now receiving unusual attention. Rugged constructions have been developed, increased current ratings have been made possible, and insulation for relatively high voltage has been provided, so that we should now have apparatus which will give the desired protection and reliability.

However, one problem is yet unanswered, at least in readily understandable form, and that is what the relative values of different arrangements of reactors are from the viewpoints of unit cost, protection afforded, space occupied and so forth. Information on the subjects will be welcomed by all companies designing new plants or remodeling old ones.

### Offhand Comparisons Must Not Be Drawn Between Expenses of Different Stations

OUR readers should be interested in the mass of data which we have been able to collect for the first time on the fuel economy and general expense of production of a considerable group of stations, part of them coal-burning and another group burning oil or other fuels. These stations range in capacity from 170,000 kw. to less than 1,000 kw., and in annual load factor from 55 per cent to 6½ per cent, representing therefore a wide variation in load conditions.

A brief analysis of the general character of the results shows that there is a notable correlation between the load factor, the characteristics of the fuel and economy. This is as might be expected, but it is most notable when one segregates the stations into groups according to output and compares the groups. When it comes to an investigation of the lists, station by station, group correlations seem very much less striking, and one is impressed with the enormous difference between individual stations in production expense. For example, station No. 18 shows a total production expense of 0.526 cent. It is of 20,000 kw. capacity and its annual load factor is a little less than 40 per cent. Station No. 17, of the same rating and with an annual load factor of 59 per cent, shows more than double the total production expense. A little examination shows that it is burning a lower grade of coal and burning it inefficiently, so that the B.t.u. required per kilowatt-hour is almost 50 per cent in excess of what is required by the other station.

From an example like this it becomes evident that the annual load factor is not the really significant figure, since this may be none too high, and yet the station, save for unused capacity, may be operated in an extremely efficient and economical manner. A load factor week in and week out for the units in use or held under steam is a more important criterion for efficiency. The largest station of all here considered has slightly lower coal consumption but much lower B.t.u. per kilowatt-hour than No. 18 and a materially higher load factor. Still, it shows a somewhat greater total expense. In this instance it was chiefly due to an evidently higher cost for coal and for wages. Local factors like coal and wages have an all-important bearing on the final cost of production, so that no safe conclusion as to cost can be drawn by comparing one plant with another without very careful analysis of these data. An example in point here is plant No. 13, with the lowest coal consumption per kilowatt-hour of the entire steam-driven group, but with a relatively high expense for wages and superintendence. The result is a cost of 1.015 cents for the total production expense.

Still another example of how not to draw parallels between miscellaneous plants about which one has imperfect knowledge is to be found in the case of plant No. 29 of 3,750-kw. rating, 18.9 per cent annual load factor and a heat debit of 44,000 B.t.u. per kilowatt-hour. On their face these figures are scandalous, but

the fuel cost is exceptionally small and the final total production expense with a handicap against it of only 1.09 cents per kilowatt-hour, a figure lower than the average of the group with from 20,000-kw. to 30,000-kw. rating and very much higher average annual load factor.

The data from the oil-burning plants are of a much less detailed and satisfactory character. Some of them are conspicuously high, others notably low, but the full data are in most instances missing. The same is true of some of the plants burning gas and hogged fuel. It would be very interesting to investigate the relation in these stations between the annual load factor as stated and the average daily load factor with respect to plant in use. It is the latter rather than the former which bears directly upon the working efficiency of the installation, while the former has a significant correlation with the investment charge per kilowatt generated.

We believe that it is well worth while to continue studies along this general line to increase the available knowledge as to generating costs of electricity. If some of the enthusiastic advocates of municipal ownership who are always harping about what some station in a remote part of the country has accomplished would settle down to a serious study of data like those which we here present, we think they would quickly see the futility of offhand estimates as to costs of electrical service.

## Why Some Appliances Are Not Being Used

RESIDENCE surveys in many cities are serving to focus attention on a matter which has already been sidestepped for too long a time. We have known that a goodly number of folk have laid away their chafing dishes, percolators, grills and even their flat-irons on the closet shelf and have given up the use of them. And we have said that this is natural, because so many people purchase things like this on impulse and then, because old habits and traditions die hard, carelessly neglect to organize unaccustomed elements of service into their daily living.

But the surveys have discovered also that too many housewives are not using their vacuum cleaners and their clothes washers and their fans and mixing motors in the way they should. They are not depending on them enough. They are not using them as often and as much as we have taken for granted that they would.

There is nothing to be alarmed at. Most people who possess these electrical appliances do use them because of their great labor-saving and comfort value. But the fact that any of these appliances are abandoned or half-used is something that concerns us all.

The reason seems to be a lack of thoroughness in selling. Salesmen are taking advantage of the ready appeal of these household devices to sell them easily, without establishing adequate enduring confidence in the need for their constant use. For clearly no woman would apply a vacuum cleaner once a month and broom-sweep in between who really understood the superior cleanliness of the electric sweeper. It is not enough for the dealer or the central-station or the manufacturer to sell such an appliance. He must so sell it that it will be used habitually with complete reliance. And apparently it would be well for electrical appliance salesmen to give more thought to this.

## Does Relay Protection Pay for Itself?

MANY engineers have been faced with the questions of "Isn't the investment in the relay and allied equipment of a power system too large a proportion of the total investment?" and "Does relay protection pay for itself?" Based on both confidential and public information which we have received, these questions can be answered in favor of relay protection, when properly selected, installed, inspected and maintained.

In one case referred to, which involves one of the most congested distribution systems in the country and which has the reputation of being the most effectively protected, the investment in relays, accessory transformers and the like is only one-tenth of 1 per cent of the total system investment. This seems to be a very modest proportion considering the purpose of relays.

On another system, during the last five years, it has been possible to reduce the total number of interruptions in thirteen typical substations (about 15 per cent of the total) from 270 to 21, despite the fact that the number of cases of trouble have been reduced only about half or from 288 to 130. Furthermore, the capital expenditure for this protection only amounted to $25,000, which at 15 per cent makes the fixed charges $3,750. Adding to this the costs of engineering, maintenance and testing, the total annual charges are only $8,050, which are offset by the saving in revenue of $8,350 through reduction in interruptions.

Hence this relay system is paying for itself, not including any intangible value that can be placed on maintaining the public confidence in reliability of central-station service.

## Experience in Severe Climates Will Determine Extent of Outdoor Metering

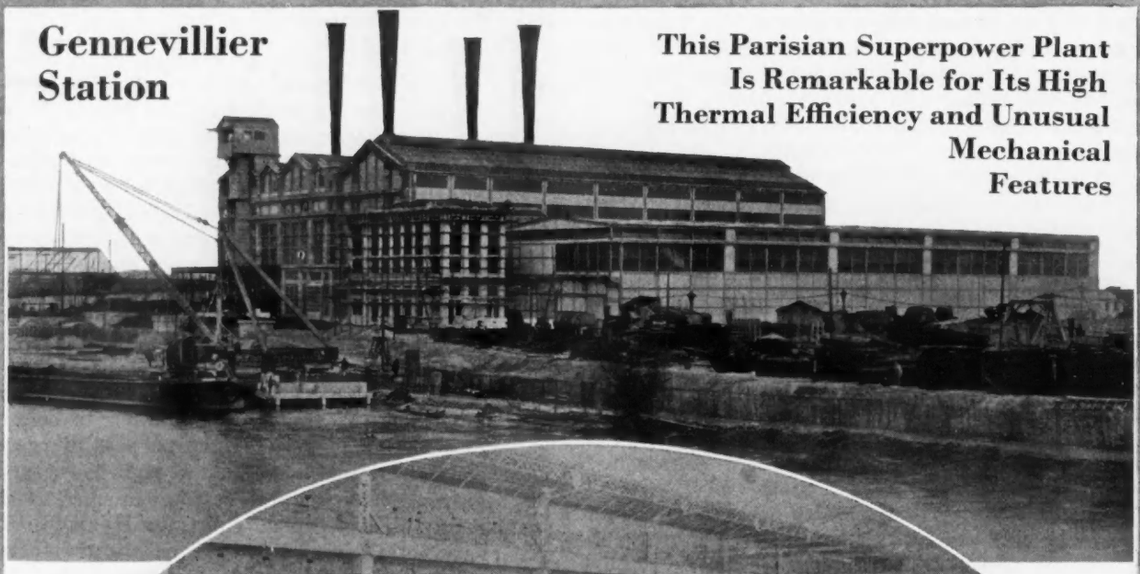
OUTDOOR metering has been carried on successfully over a period of years despite the obstacles imposed by dense sea fogs, according to the report in this issue by H. R. Thomas. He points out that the Southern California Edison Company has developed standard outdoor metering equipment that has been used extensively in 10,000 and 15,000-volt installations. Many engineers may contend that the weather conditions in the section served are such as to make outdoor metering a relatively simple proposition. However, the success of such an undertaking in one section of the country should indicate the possibility of similar results in another if additional precautions are taken to meet local weather conditions.

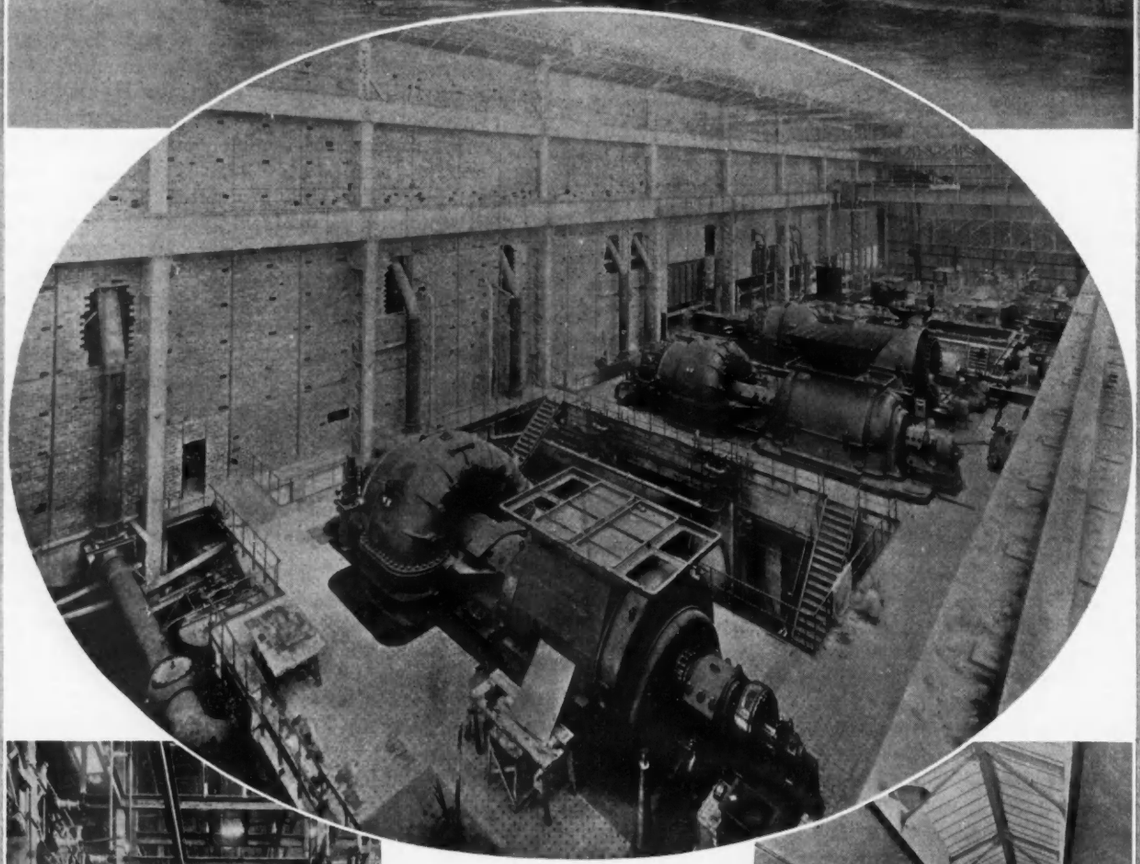
From an economic viewpoint outdoor metering is a very attractive proposition in many cases. In most places where customers are furnished primary energy or distribution voltages up to 15,000 volts it has been necessary up to the present time to install expensive vaults to hold the metering equipment. Outdoor switches have come to be generally accepted, but outdoor metering equipment has not received the same extensive acceptance. Experience in California points out the possibility of metering primary customers outdoors, and further reports from more severe climates will determine the extent to which it will be carried.

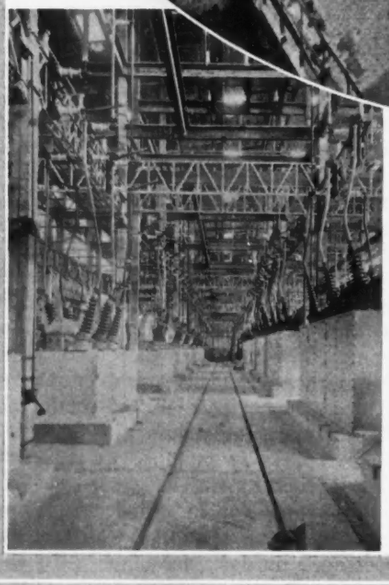
The prospect of a considerable reduction in investment clearly emphasizes the necessity of investigating the possibilities of such outdoor installations in all sections of the country.

# Gennevillier Station

## This Parisian Superpower Plant Is Remarkable for Its High Thermal Efficiency and Unusual Mechanical Features







THIS new 320,000-kw. (ultimate) plant of the Union de l'Electricité, Paris, which has been in the limelight ever since it was started, now has three 40,000-kw. turbo-generators in operation and the fourth will be running the latter part of this year. Eventually eight units will be installed. All of them are of the Zölley type and are designed to operate under 280 deg. superheat and 320 lb. pressure at the nozzles. The guaranteed steam consumption at full load is 9.62 lb. per kw.-hr. and at three-quarters load is 9.46 lb. Among other features of the plant are the use of two types of boilers, one with chain-grate and the other with underfeed stokers; ejector-produced draft; both air preheaters and economizers; recovery of generator losses; purification and degasification of feedwater and the bleeding of the turbines for main heating of feedwater. These features will be discussed in an early issue.

# Fuel Economy and Production Expenses

## Data Are Given for Electric Plants Burning Coal, Oil, Gas and Hogged Fuel—Careful Analysis of Data Permits Interesting Comparisons Between the Results Obtained

By ALLEN M. PERRY
*Engineering Editor Electrical World*

TO AFFORD a basis for comparison of plant performances and production expenses, but chiefly to show how these figures are affected by load factor, characteristics of coal, plant size, etc., the *Electrical World* has collected the accompanying data from fifty-five central-station companies. The data show in a striking manner that plants of similar rating develop a kilowatt-hour with widely different B.t.u. inputs and operating expenses. Hence the occasional contention that one station should be able to generate energy at the same expense as another of the same rating derives little support from these data. The data do, however, serve to indicate what results are possible of attainment under identical conditions.

It would be interesting to try to detect any relation between plant condition (such as modernity, upkeep, etc.) and fuel economy or operating expenses, but it is impossible to indicate adequately the condition of so many plants in a table of reasonable size. Management and the human factor involved in station labor are other important considerations which could not be converted into tangible figures, all of which should indicate that definite conclusions cannot be drawn from statistics alone, although they may be of considerable value. Despite the many factors which influence operating economy and production expense, it is interesting to observe how closely the results obtained follow the load factor and coal characteristics. For illustrative purposes the data will be considered in groups.

### LOWEST OPERATING EXPENSES OF ALL REPORTED

Of the first group indicated, the 170,000-kw. station with 51 per cent load factor has the highest fuel economy of all stations reported, namely, 20,250 B.t.u. per kw.-hr. It also has the lowest production expenses for the group. Very good economy was also obtained in the other 170,000-kw. station and 150,000-kw. station operating at 48.1 per cent load factor. The relatively high production expenses of station 1a, 1b and 2, compared with the next smaller group, were unexplained by the contributors of the data, but they may be due to the age of the stations, the high unit wage expense and the excessive steam equipment maintenance.

In the 50,000-60,000-kw. class the best fuel economy, namely, 22,950 B.t.u. per kilowatt-hour, was obtained in a 60,000-kw. plant operating at 44.2 per cent load factor and burning 13,124 B.t.u. coal containing 9.6 per cent ash. This performance was obtained despite the fact that its load factor was lower than that of some other stations in the group, but this may be attributed to the fact that it is the most modern station in the group and to the relatively high-grade coal burned. This station also incurred the lowest total production expense of all steam stations reported, namely, 4.87 mills.

The general manager of the station mentioned made the following comment in submitting the data:

"We wish to call your attention to the fact that during 1921 our operating conditions at ——— were in no wise normal, owing to the necessity of operating the main generating units for several months during this period at a low load factor. Our present operation is at a load factor of approximately 75 per cent, changing our generating cost very materially.

"While the average fuel cost for the year 1921 was 3.63 mills per kilowatt-hour, we are now operating at a fuel cost of less than 3 mills per kilowatt-hour, with a corresponding reduction in total net generating costs, which may be considered the normal performance of this station."

In the same group with this station is a 50,000-kw. station having a load factor of 45.5 per cent which developed the poorest fuel economy. However, this is largely attributable to the relatively poor coal, which contained 10,147 B.t.u. per pound and 21.4 per cent ash, and to the fact that this plant had only 30,000 kw. installed for eight months of the year reported. This fact really entitles the plant to comparison with stations in the 30,000-50,000-kw. class.

The highest operating expenses obtained in the 50,000-60,000-kw. group were incurred by a 53,000-kw. station with high load factor (51.3 per cent) burning 10,350 B.t.u. coal. The operating expenses were 7.78 mills.

Only two stations are represented in the 30,000-50,000-kw. class. The largest, rated at 44,500 kw., developed the best fuel economy (31,500 B.t.u. per kilowatt-hour) and had the lowest operating and maintenance expenses, namely, 9.56 mills and 0.95 mill respectively. A combination of bituminous and No. 3 buckwheat coal was burned in the proportions of about five to one.

A fuel economy of only 33,600 B.t.u. per kilowatt-hour was developed by the other station of the same group. Its operating and maintenance expenses were also higher, namely, 11.86 and 1.27 mills respectively. This performance, however, is due largely to the fact that the station has quite unusual load demands, providing insurance for the hydro-electric system with which it is interconnected. In this service it has a load factor of only 28.7 per cent, the demands being of a relatively sporadic character. For this reason they cannot be planned for as in a system even of the same load factor where the load fluctuations are periodic. Another handicap is the fact that this is a relatively old station, although it has been kept very nearly up to the latest standards.

### REMARKABLE ECONOMY WITH HIGH-ASH COAL

In the 20,000-30,000-kw. class the best fuel economy (22,700 B.t.u. per kilowatt-hour) was developed by a 20,000-kw. station operating at a load factor of 39.7 per cent with coal containing 13,938 B.t.u. and 18

# Operating Economy and Production Expenses of Fifty-five Generating Stations

| | Rating Coal-Burning Stations, Kw. | Annual Load Factor, Per Cent | Output, Kw.-hr. Twelve Months | Peak Load, Kw. | Total Coal Used Twelve Months | B.t.u. per Lb. Of Fuel | Per Cent Ash | Lb. Coal per Kw.-hr. | B.t.u. per Kw.-hr. | Operating Expense, Cents per Kw.-hr. Delivered from Switchboard: Fuel | Wages | Superintendence, and Misc. | Total | Maintenance Expense, Cents Per Kw.-hr. Delivered from Switchboard: Station Building | Steam Equipment | Electrical Equipment | Total | Total Production Expense | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 170,000 | 51.0 | 527,121,000 | 118,000 | 427,000 | ..... | .... | 1.62 | 20,250 | 0.532 | 0.069 | 0.026 | 0.627 | 0.011 | 0.045 | 0.002 | 0.058 | 0.685 | ..... |
| 1a | 170,000 | 38.4 | 461,809,700 | 137,450 | 390,602 | 13,879 | 7.3 | 1.690 | 23,460 | 0.737 | 0.105 | 0.040 | 0.882 | 0.023 | 0.095 | 0.008 | 0.126 | 1.008 | ..... |
| 1b | 150,000 | 43.2 | 493,848,800 | 131,000 | 503,705 | 13,218 | 10.0 | 2.020 | 27,000 | 0.896 | 0.114 | 0.0390 | 1.049 | 0.024 | 0.138 | 0.018 | 0.180 | 1.229 | ..... |
| 1c | 150,000 | 48.1 | 473,782,743 | 112,500 | 410,441 | 13,396 | 9.98 | 1.735 | 23,720 | 0.746 | 0.0670 | 0.024 | 0.837 | 0.007 | 0.052 | 0.019 | 0.078 | 0.915 | ..... |
| 2 | 95,000 | 11.2 | 57,026,700 | 58,000 | 70,460 | 12,713 | 12.5 | 2.46 | 31,400 | 0.782 | 0.167 | 0.088 | 1.037 | 0.035 | 0.131 | 0.005 | 0.171 | 1.208 | ..... |
| 3 | 60,000 | 44.2 | 239,936,000 | 62,000 | 209,596 | 13,124 | 9.6 | 1.75 | 22,950 | 0.363 | ‖‖0.062 | ¶¶0.028 | 0.453 | 0.004 | 0.027 | 0.003 | 0.034 | 0.487 | ..... |
| 4 | 56,000 | 42.3 | 108,829,278 | 29,358 | 139,429 | 10,983 | 12.9 | 2.56 | 28,200 | 0.530 | 0.089 | 0.031 | 0.650 | 0.018 | 0.061 | 0.016 | 0.095 | 0.745 | ..... |
| 5 | 53,000 | 51.3 | 127,758,800 | 28,400 | 152,799 | 10,350 | .... | 2.39 | 24,800 | 0.700 | 0.055 | 0.023 | 0.778 | 0.007 | 0.077 | 0.006 | 0.090 | 0.868 | ..... |
| 6 | 52,000 | 38.2 | 164,464,720 | 49,200 | 157,290 | 12,216 | .... | 1.91 | 23,350 | 0.632 | 0.078 | 0.010 | 0.720 | 0.004 | §§ | §§ | 0.058 | 0.778 | ..... |
| 7 | *50,000 | 45.5 | 201,550,584 | 50,650 | 330,519 | 10,147 | 21.4 | 3.28 | 33,300 | 0.361 | 0.072 | 0.059 | 0.492 | 0.014 | 0.116 | 0.097 | 0.227 | 0.719 | ..... |
| †8 | 44,500 | 27.6 | §§34,017,300 | 28,115 | 32,490 | 14,300 | 8.3 | 2.29 | 31,500 | 0.780 | 0.098 | 0.078 | 0.956 | 0.015 | 0.073 | 0.007 | 0.095 | 1.051 | Bituminons and No. 3 buckwheat coal burned |
| | | | | | 6,408 | 11,000 | 20.0 | | | | | | | | | | | | |
| 9 | 36,000 | 28.7 | 78,579,120 | 31,200 | 94,800 | 13,960 | 8.8 | ..... | 33,600 | 0.949 | 0.162 | 0.075 | 1.186 | 0.013 | 0.107 | 0.007 | 0.127 | 1.313 | Standby for hydro-electric system |
| | | | | | ‡14,000 | 18,500 | | | | | | | | | | | | | Burns coal and oil |
| 10 | 29,500 | 38.2 | 59,775,632 | 17,970 | 133,410 | 10,043 | 17.5 | 4.47 | 44,900 | 0.648 | 0.116 | 0.029 | 0.793 | 0.005 | 0.061 | 0.022 | 0.088 | 0.881 | ..... |
| 11 | 26,150 | 42.1 | 44,405,000 | 12,050 | 96,556 | 9,000 | 12.0 | 4.34 | 39,100 | 0.918 | 0.141 | 0.004 | 1.063 | 0.001 | 0.082 | 0.060 | 0.143 | 1.206 | ..... |
| 12 | 22,600 | 47.9 | 45,783,090 | 10,900 | 57,966 | 10,330 | 14.0 | 2.53 | 26,200 | 0.920 | 0.120 | 0.080 | 1.120 | Neg. | 0.260 | 0.070 | 0.330 | 1.450 | ..... |
| †13 | 22,500 | 43.0 | §§30,134,000 | 16,000 | 24,293 | 14,600 | 7.0 | 1.61 | 23,600 | 0.695 | 0.109 | 0.081 | 0.885 | 0.022 | 0.103 | 0.055 | 0.130 | 1.015 | ..... |
| †14 | 20,750 | 34.0 | 17,479,655 | 11,700 | 16,921 | 14,353 | 7.0 | 1.94 | 27,800 | 0.800 | 0.192 | 0.044 | 1.036 | 0.012 | 0.057 | 0.011 | 0.080 | 1.116 | Coal at $8.25 a ton |
| †15 | 20,500 | 35.7 | 16,903,667 | 10,800 | 19,143 | 14,800 | 9.0 | 2.26 | 33,550 | 1.101 | 0.244 | 0.061 | 1.315 | 0.054 | 0.076 | 0.007 | 0.137 | 1.452 | Coal at $8.97 a ton |
| 16 | 20,000 | 4.8 | 5,857,000 | 13,700 | 20,700 | 14,300 | .... | 7.07 | 101,100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4.930 | Standby for hydro-electric system |
| 17 | 20,000 | 59.0 | 47,358,299 | 9,200 | 68,359 | 11,350 | 14.0 | 2.89 | 32,800 | 0.707 | 0.155 | 0.089 | 0.951 | 0.012 | 0.079 | 0.038 | 0.129 | 1.080 | ..... |
| 18 | 20,000 | 39.7 | 69,623,000 | 20,000 | 56,565 | 13,938 | 18.0 | 1.63 | 22,700 | 0.429 | 0.046 | 0.017 | 0.492 | 0.001 | 0.028 | 0.005 | 0.034 | 0.526 | ..... |
| †19 | 18,500 | 41.3 | 20,126,100 | 11,100 | 19,532 | 14,500 | 7.0 | 1.94 | 28,200 | 0.855 | 0.130 | 0.023 | 1.008 | 0.006 | 0.034 | 0.007 | 0.047 | 1.055 | Coal at $8.82 a ton |
| 20 | 18,000 | 39.0 | 60,269,400 | 17,600 | 62,563 | 13,775 | 8.2 | 2.08 | 28,600 | 0.530 | 0.088 | 0.020 | 0.638 | 0.001 | 0.062 | 0.004 | 0.067 | 0.705 | ..... |
| 21 | 16,500 | 36.5 | 36,111,820 | 11,300 | 48,272 | 13,500 | 10.0 | 2.67 | 36,100 | 0.876 | 0.162 | 0.022 | 1.060 | 0.022 | 0.119 | 0.023 | 0.164 | 1.224 | Operated in conjunction with water power |
| †22 | 16,100 | 40.7 | 10,701,600 | 6,000 | 10,860 | 14,450 | 6.5 | 2.03 | 29,300 | 1.370 | 0.313 | 0.128 | 1.711 | 0.032 | 0.212 | 0.060 | 0.304 | 2.015 | Coal at $10.19 a ton |
| †23 | 13,100 | 35.8 | 5,720,680 | 3,650 | 7,090 | ..... | .... | 2.48 | ..... | 1.100 | 0.340 | 0.105 | 1.545 | 0.021 | 0.090 | Neg. | 0.111 | 1.656 | Coal at $8.963 a ton |
| 24 | 10,000 | 38.2 | 18,092,320 | 5,400 | 27,057 | ..... | ..... | 2.99 | ..... | 0.792 | 0.075 | 0.079 | 0.946 | ..... | ..... | ..... | 0.019 | 0.965 | |
| 25 | 10,000 | 42.8 | 27,419,574 | 7,300 | 33,792 | 11,500 | 10.5 | 2.46 | 28,300 | 0.740 | 0.076 | 0.001 | 0.817 | Neg. | 0.003 | Neg. | 0.003 | 0.821 | ..... |
| 26 | 8,500 | 45.5 | 29,914,900 | 7,500 | 38,026 | ..... | 12.0 | 2.54 | ..... | 0.536 | 0.098 | 0.001 | 0.635 | ..... | ..... | ..... | 0.094 | 0.729 | ..... |
| 27 | 8,500 | 42.5 | 26,029,860 | 7,000 | 37,049 | 12,500 | 14.5 | 2.84 | 35,600 | 0.611 | 0.110 | 0.050 | 0.770 | 0.010 | 0.090 | 0.010 | 0.110 | 0.880 | ..... |
| †28 | 7,500 | 36.1 | §§5,395,500 | 3,400 | 9,360 | 14,450 | 9.0 | .... | ..... | 1.280 | 0.341 | 0.163 | 1.784 | 0.025 | 0.092 | Neg. | 0.117 | 1.901 | Burns coal and coke breeze |
| | | | | | ‡‡291 | | | | | | | | | | | | | | |
| 29 | 3,750 | 18.9 | 5,965,870 | 3,600 | 11,909 | 11,000 | 18.2 | 4.00 | 44,000 | 0.550 | 0.250 | 0.090 | 0.890 | 0.020 | 0.150 | 0.030 | 0.200 | 1.090 | ..... |
| 30 | 2,000 | 35.3 | 2,950,590 | 954 | 8,657 | 9,000 | .... | 5.86 | 52,800 | 1.238 | 0.330 | ..... | ..... | ..... | ..... | ..... | 0.100 | ..... | ..... |
| 31 | 750 | 26.6 | 1,376,900 | 590 | 4,087 | 11,000 | .... | 5.94 | 65,300 | 1.530 | 0.613 | ..... | ..... | ..... | ..... | ..... | 0.040 | ..... | ..... |

| | Rating Oil-Burning Stations, Kw. | Annual Load Factor, per Cent | Output, Kw.-hr. Twelve Months | Peak Load, Kw. | Total Oil Used Bbls. Twelve Months | B.t.u. per Lb. Of Fuel | Deg. Baumé | Bbls. Oil per Kw.-hr. | B.t.u. per Kw.-hr. | Operating Expense, Cents Per Kw.-hr. Delivered from Switchboard: Fuel | Wages | Superintendence, and Misc. | Total | Maintenance Expense, Cents Per Kw.-hr. Delivered from Switchboard: Station Building | Steam Equipment | Electrical Equipment | Total | Total Production Expense | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 64,000 | 25.6 | 126,510,000 | ..... | 635,229 | ..... | 18.0 | 0.00502 | ..... | ..... | ..... | ..... | 0.984 | ..... | ..... | ..... | 0.123 | 1.107 | ..... |
| 33 | 47,000 | 40.0 | 164,860,000 | ..... | 675,887 | ..... | 16.0 | 0.00410 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.900 | ..... |
| 34 | 39,000 | 11.5 | 40,030,000 | ..... | 220,766 | ..... | 16.0 | 0.00552 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.060 | ..... |
| 35 | 33,500 | 19.5 | 59,980,000 | ..... | 301,846 | ..... | 18.0 | 0.00503 | ..... | ..... | ..... | ..... | 1.080 | ..... | ..... | ..... | 0.254 | 1.334 | ..... |
| 36 | 30,000 | 8.9 | 15,230,000 | ..... | 96,922 | ..... | 17.0 | 0.00636 | ..... | ..... | ..... | ..... | 1.842 | ..... | ..... | ..... | 0.115 | 1.957 | ..... |
| 37 | 28,000 | 55.0 | 98,777,500 | 20,500 | ..... | ..... | ..... | ..... | ..... | 0.695 | 0.032 | 0.032 | 0.759 | 0.013 | 0.095 | 0.009 | 0.117 | 0.876 | Burns oil and gas |
| 38 | 27,000 | 22.0 | 52,060,000 | ..... | 303,368 | ..... | 18.0 | 0.00582 | ..... | ..... | ..... | ..... | 1.289 | ..... | ..... | ..... | 0.169 | 1.458 | ..... |
| †39 | 14,250 | 22.6 | §§20,601,900 | 20,800 | 102,823 | 18,200 | .... | ..... | 30,200 | ¶0.680 | ¶0.099 | ¶0.072 | ¶0.851 | ¶0.014 | ¶0.012 | Neg. | ¶0.111 | ¶1.656 | Oil at $1.366 per bbl. |
| 40 | 10,000 | 55.3 | 56,140,000 | ..... | 273,235 | ..... | 17.4 | 0.00487 | ..... | ..... | ..... | ..... | 1.089 | ..... | ..... | ..... | 0.058 | 1.147 | ..... |

| | Rating Hogged Fuel Stations, Kw. | Annual Load Factor, Per Cent | Output, Kw.-hr. Twelve Months | Peak Load, Kw. | Total Hogged Fuel Used Units Twelve Months | Deg. Baumé | | | Operating Expense, Cents per Kw.-hr. Delivered from Switchboard | | | | Maintenance Expense, Cents per Kw.-hr. Delivered from Switchboard | | | | Total Production Expense | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Fuel | Wages | Superintendence, and Misc. | Total | Station Building | Steam Equipment | Electrical Equipment | Total | | |
| 14 | 10,000 | 41.5 | 30,563,230 | 8,400 | ..... | ..... | ..... | ..... | 0.790 | 0.100 | 0.076 | 0.966 | 0.026 | 0.160 | 0.015 | 0.201 | 1.167 | ..... |
| 42 | 9,250 | 39.4 | 19,994,280 | 5,800 | 111,000<br>‖189,023 | 19,000 | ..... | 35,190 | 1.000 | 0.088 | ..... | ..... | 0.003 | 0.042 | 0.026 | 0.071 | ..... | Burns oil and gas |
| 43 | 8,575 | 40.4 | ††8,095,847 | 5,100 | 241,000<br>§2,208 | ..... | ..... | ..... | 0.257 | 0.082 | 0.012 | 0.351 | 0.001 | 0.034 | 0.014 | 0.049 | 0.400 | Fuel oil, water-gas oil and coal used |
| 44 | 7,200 | 23.6 | 7,790,000 | ..... | 62,002 | ..... | 17.4 | 0.00795 | ..... | ..... | ..... | 1.856 | ..... | ..... | ..... | 0.189 | 2.045 | ..... |
| 45 | 6,600 | 14.0 | 6,340,000 | ..... | 21,540 | ..... | 16.5 | 0.00340 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.940 | ..... |
| †46 | 6,500 | 30.0 | 4,663,930 | 3,550 | 30,800<br>$313 | 18,250<br>14,200 | ..... | 42,000 | 1.150 | 0.226 | 0.056 | 1.432 | Neg. | 0.157 | Neg. | 0.157 | 0.589 | Oil at $0.0391 a gal. and coal at $10.205 a ton |
| 47 | 5,000 | 6.5 | 4,000,000 | ..... | 24,383 | ..... | 18.0 | 0.00608 | ..... | ..... | ..... | 1.749 | ..... | ..... | ..... | ..... | 2.989 | ..... |
| 48 | 5,000 | 36.5 | 11,355,272 | 3,550 | 722,000<br>§3,487 | 18,000<br>11,330 | ..... | 45,000 | 1.307 | 0.187 | 0.134 | 1.628 | 0.010 | 0.189 | 0.003 | 0.202 | 1.830 | ..... |
| 49 | 4,000 | 30.3 | 10,108,916 | 3,800 | ..... | ..... | ..... | ..... | 1.240 | 0.190 | 0.150 | 1.580 | 0.100 | 0.130 | 0.050 | 0.280 | 1.860 | Burns oil and gas |
| 50 | 18,500 | 21.0 | 33,340,000 | ..... | 96,900<br>**4,408 | ..... | ..... | ..... | 0.246 | ..... | ..... | 0.413 | ..... | ..... | ..... | 0.166 | 0.579 | Burns hogged fuel and oil |
| 51 | 13,000 | 10.0 | 9,340,000 | ..... | 35,633<br>**1,832 | ..... | ..... | ..... | 0.395 | ..... | ..... | 0.714 | ..... | ..... | ..... | 0.296 | 1.010 | Burns hogged fuel and oil |
| 52 | 7,500 | 17.2 | 14,150,000 | ..... | 28,959<br>**3,062 | ..... | 16.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.920 | Burns hogged fuel and oil |

* For eight months the plant was rated at 30,000 kw.
† For the six months ended Dec. 31, 1921.
‡ Fuel oil, gallons.
‖ Cubic feet of gas, 950 B.t.u. per cubic foot.
¶ Costs based on kilowatt-hours generated.
§ Coal used in addition to fuel oil.
** Barrels of fuel oil.
†† Total power generated and purchased.
‡‡ Coke breeze.
‖‖ Including superintendence.
¶¶ Not including superintendence.
§§ Power also purchased, but is not included.
x Approximate rating.

per cent ash. Furthermore, at this station the lowest operating and maintenance expenses were incurred, namely, 4.92 and 0.34 mills respectively. This is a rather remarkable performance considering the high ash content.

The poorest economy and the highest production expenses characterized another 20,000-kw. station, which operated at the abnormally low load factor of 4.8 per cent. This plant is merely a standby for a hydro-electric system. Being very old, it is doubtful whether economical results could be obtained even if operating conditions were more favorable.

Another station in this group which was not so handicapped by poor load factor had the next poorest fuel economy, but this may have been due to the poor coal, its content being 10,043 B.t.u. and 17.5 per cent ash.

High operating expenses were incurred by the 20,500-kw. station in this group, due evidently to high unit fuel and labor prices. It is possible that the high maintenance expense of the 22,600-kw. station was due to the high-ash coal since the steam-plant maintenance is the largest item of this expense.

## LOW RELAY-PLANT ECONOMY THE PRICE OF SERVICE RELIABILITY

In the 10,000-20,000-kw. group the best fuel economy (28,200 B.t.u. per kilowatt-hour) was developed by an 18,500-kw. station having a semi-annual load factor of 41.3 per cent and burning coal containing 14,500 B.t.u. and 7 per cent ash. The poorest economy (36,100 B.t.u. per kilowatt-hour) was developed by a 16,500-kw. station having 36.5 per cent load factor and burning 13,500-B.t.u. coal containing 10 per cent ash; but this is due to the fact that the station operates in conjunction with a water-power plant. For about eight or nine months of the year it serves merely as a relay for the hydro-electric system. During the remainder of the year it operates at about 80 per cent load factor. The management expressed the belief that if this station could be operated with an average monthly load factor equal to its present annual load factor much better results could be obtained.

The highest operating and maintenance expenses were piled up by a 16,100-kw. station operating at 40.7 per cent semi-annual load factor and using 14,450-B.t.u. coal containing 6.5 per cent ash. The high operating expense was due evidently to the fact that coal cost $10.19 a ton. As may be observed, the steam equipment maintenance expense was relatively high.

For low operating expense the 18,000-kw. station operating with a 39 per cent annual load factor takes first place in this group, while the 10,000-kw. station with a load factor of 42.8 per cent excels in lowest maintenance expense.

In the 5,000-10,000-kw. group the lowest combined operating and maintenance expenses (7.29 mills per kilowatt-hour) were incurred by an 8,500-kw. station operating at 45.5 per cent local factor but with 12 per cent ash. The highest production expense was reported by a 7,500-kw. station operating at 36.1 per cent load factor on a mixture of Pocahontas coal and coke breeze in the proportion of fifty to one. The bituminous coal contained 14,450 B.t.u. and 9 per cent ash. Wages, fuel and superintendence were particularly high.

In the group representing stations under 5,000 kw. the best economy was submitted by a 3,750-kw. station operating at 18.9 per cent load factor with 11,000 B.t.u.

coal containing 18.2 per cent ash. The economy was 44,000 B.t.u. per kilowatt-hour, and the operating and maintenance expenses 8.9 and 2 mills respectively. Poorest economy and highest operating expense were reported by a 750-kw. station operating at 26.6 per cent load factor and using 11,000-B.t.u. coal. The size of the plant, the load factor and the high unit fuel and wage expense account for this.

Prior to the war there was a decided downward tendency in operating costs as outputs and plants increased in size, but few medium-sized stations succeeded in producing a kilowatt-hour for less than 7.5 mills at the station bus (net manufacturing cost). In general, a station ranging from 10,000 kw. to 50,000 kw. rating and burning good-quality bituminous coal on automatic stokers with a per ton coal cost of around $4 to $5 at the outside considered itself doing well if it generated energy at a station expense, excluding fixed charges, of 8 to 10 mills per kilowatt-hour.

Then came the war, and fuel prices doubled and trebled. Outputs increased rapidly, and plants were extended at an unprecedented rate to meet service requirements. Up went the unit costs of operation, but the chief factor in this advance was the price of fuel. Larger generating units were installed and a sharp watch on boiler-plant operation was maintained. Interconnection began to be felt as a factor in regional power production, and the saving in fuel resulting was marked. Production costs exclusive of overhead went in many plants of good type to 1.25 to 1.5 cents per kilowatt-hour, and had it not been for the engineering supervision given to these plants, there is little question that some of those which prided themselves on their moderate costs would have reached or exceeded 2 cents. Some reduction in the price of coal is now evident. Today some of these plants are getting back to the region of a net station cost of about 9 or 10 mills per kilowatt-hour.

The writer is indebted to H. S. Knowlton, New England editor; J. C. Martin, Western editor, and G. E. Armstrong, Pacific Coast editor, for their assistance in procuring the foregoing data.

## The Superpower System in France

THE superpower idea has progressed very rapidly in France, owing particularly to the availability of many water-power sites both in France and in neighboring countries, especially Switzerland, Italy and Spain, and the very high cost of coal. It is therefore not surprising to find that a great deal of engineering thought has been given to the interconnections of the many existing and proposed water-power plants and steam plants of France. The matter of the electrification of railroads is also being considered seriously.

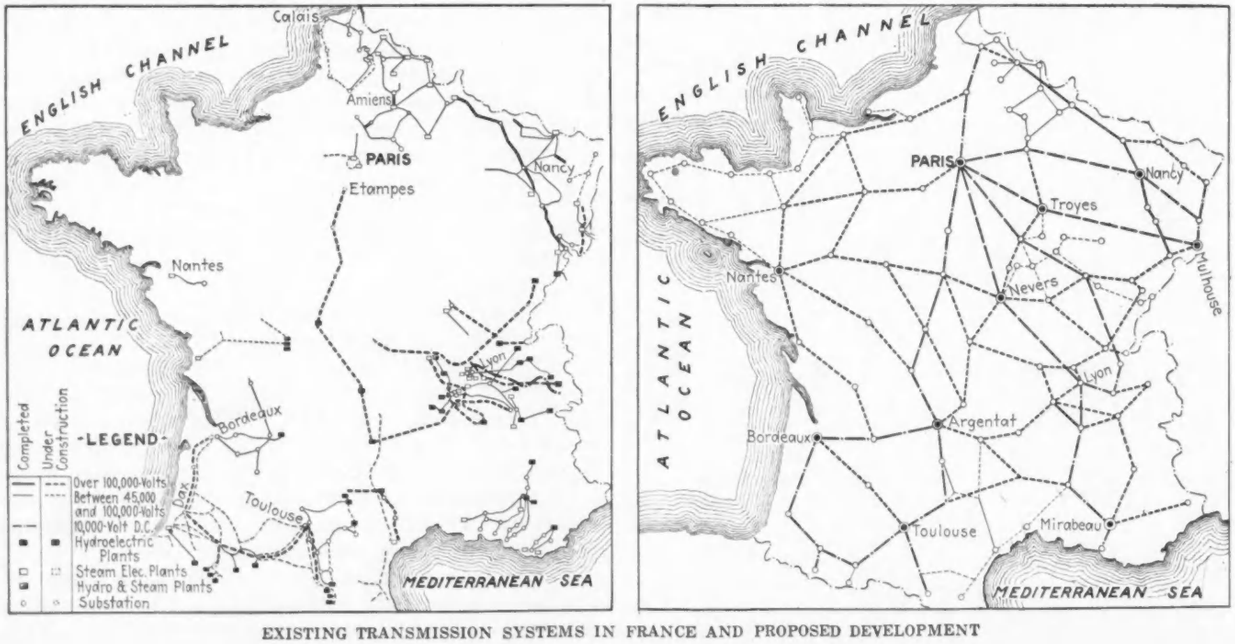
Two maps are shown which indicate the present status of such systems and the proposed plans. The first map shows the development to date of lines of 45,000 volts and over, indicating the existence of twenty-six large power companies. The second map shows the system into which the existing lines will fit when the plan is completed. Five important systems at 150,000 volts are proposed, with facilities for interconnections, each one making use of the available water power in its territory and whatever steam plants are necessary. These systems are meant to supply energy for the electrification of the railroads. The matter of financing and controlling them has been considered and the following methods are proposed:

1. The lines are to be built by the state with or without the assistance of private capital. After construction the control is to be turned over to a board of directors whose personnel is to be made up two-fifths of government officials and three-fifths of officials of the companies that are formed to operate these systems.

2. Concessions will be given by the government for construction and operation of these systems to companies.

3. Concessions will be given for construction and operation, in which the railroads will be expected to invest up to a certain stated amount and in which they will have voice in operating matters.

4. Concessions will be given for construction and operation to companies with or without financial assistance from the state. This plan has the advantage of giving the most incentive to private enterprise.




EXISTING TRANSMISSION SYSTEMS IN FRANCE AND PROPOSED DEVELOPMENT

# Cost of Outdoor Metering Installations

## Data Given for 2,200-Volt, 10,000-Volt and 15,000-Volt Installations of the Southern California Edison Company — Features of Construction Presented

By HALBERT R. THOMAS
*Testing and Meter Department, Southern California Edison Company*

THERE are a number of manifest advantages in the practice of placing electric meters out of doors, at least for certain classes of installations. Chief among these advantages is the accessibility of the meter for reading, inspection and testing, which nearly always involves some inconvenience to the consumer when the meter is in the building. Second calls forced by locked premises are eliminated with the outdoor installation. Industrial plants frequently have no desirable place for meters on account of dust, fumes, vibration, liability to physical damage or lack of room for the uncrowded type of instrument favored by the modern meterman. In some cases outdoor metering becomes virtually a necessity; for instance, service supplied to a group of oil wells at transmission voltage may make it obligatory either that the meter be placed outdoors or that a building be erected especially to house it.

An outside meter is usually placed either on a pole or on the side of a building. In both cases it should have adequate protection from the weather. This seems so obvious as scarcely to be worth mentioning, but the operating company which installs meters out of doors soon finds that it must adopt rigid rules for their protection and employ much firmness and perseverance in the enforcement of these rules.

About ten years ago the Southern California Edison Company found itself facing a serious situation with regard to its meters in a number of cities along the seacoast. It was necessary to place many meters outside owing to the number of locked houses at certain seasons of the year. These meters were in many cases unprotected from the salt fogs blowing in from the ocean, or were inclosed in home-made boxes of various types which usually made the meter almost inaccessible for adjustment or repair. The life of the unprotected meters under these conditions was very short. In from two to five years after installation the case would be badly corroded, the cover nuts rusted on and the holes for the cover posts so enlarged that corrosion of the interior would be found to have commenced.

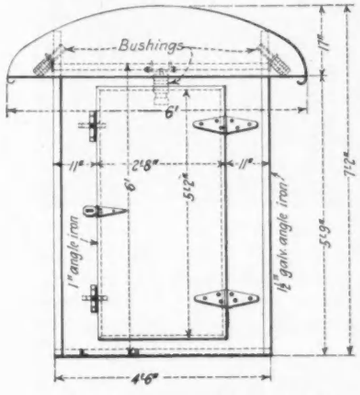



FIG. 1—GALVANIZED-IRON BOX FOR HIGH-VOLTAGE PRIMARY METERING

The adoption of a standard box was thought desirable. Such a box should combine a number of features: It should be durable, should protect the meter from rain or fog, should allow quick and accurate reading without the necessity of opening a door (which is apt to be left open), and should provide convenient access from all sides for repairs and adjustments. These requirements were met very satisfactorily by the type of box shown in Fig. 3 C and D, which is now used

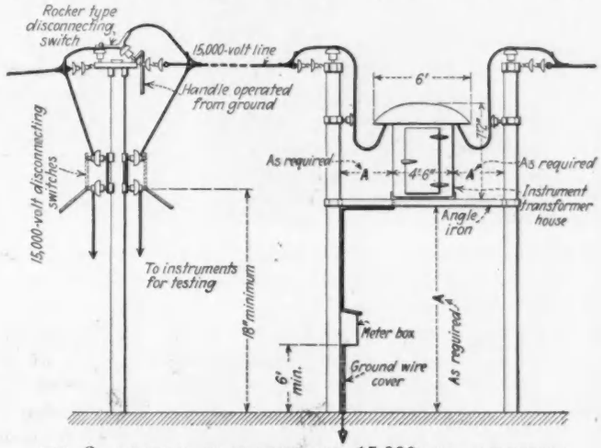



FIG. 2—TESTING FACILITIES FOR 15,000-VOLT METERING INSTALLATION THAT HAVE PROVED SATISFACTORY

for outdoor installations in both coast and inland towns. This box, which was designed by the meter department, consists of a flat back on which the meter and entrance switch are mounted and a cover attached to this back by a hook and eye on either side. A large glass in the front is provided for reading purposes, making the removal of the cover by the meter reader unnecessary. The tester, however, may easily remove the cover and gain access to the meter from all sides, as shown in Fig. 3 D. The boxes are made up in large lots in the company's shops and sold to consumers and contractors at cost, amounting to about $1.25.

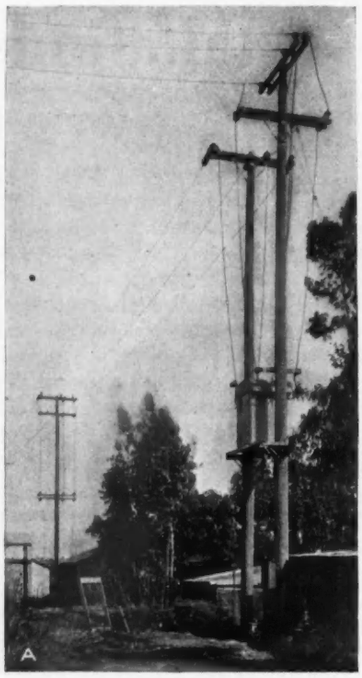
Locked premises are not a factor that compels the location of power meters out of doors, and if they are thus installed, it is usually for one of the other reasons referred to above. The majority of the power meters placed outside are of the primary type, installed with current and potential transformers.

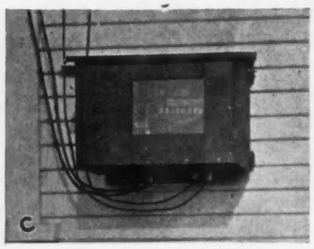
The outdoor metering of a 2,200-volt installation presents a considerably simpler problem than with some

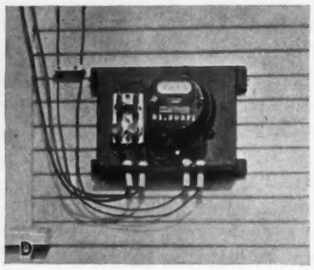
TABLE I—COST OF 2,200-VOLT OUTDOOR METERING INSTALLATION

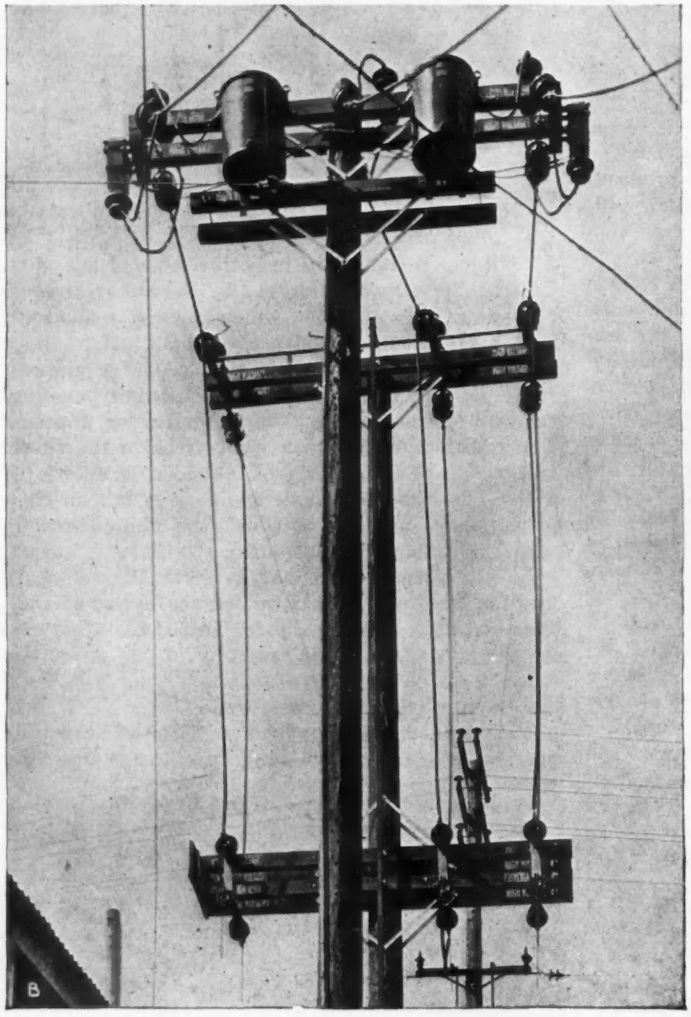
| | |
|---|---|
| One 2,200-volt weatherproof box | $8.76 |
| Two 50-watt, 2,200/110-volt potential transformers | 39.50 |
| Two 50/5-amp., 2,500-volt current transformers | 34.90 |
| One test panel | 19.32 |
| Instrument wire, cleats, tubes and miscellaneous | 4.13 |
| Cross-arms and insulators | 5.00 |
| 150 ft. No. 4 2,500-volt cotton-covered wire | 35.03 |
| Labor wiring interior of box | 7.50 |
| Labor of installation | 15.00 |
| Supply expense and overhead | 5.00 |
| Cartage, etc. | 5.00 |
| Total | $179.14 |

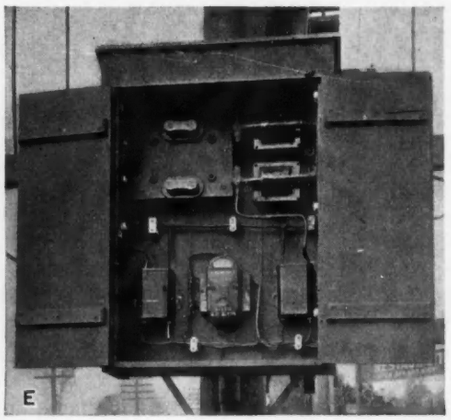
## Despite Dense Sea Fogs Outdoor Metering Is Being Successfully Used by the Southern California Edison Company



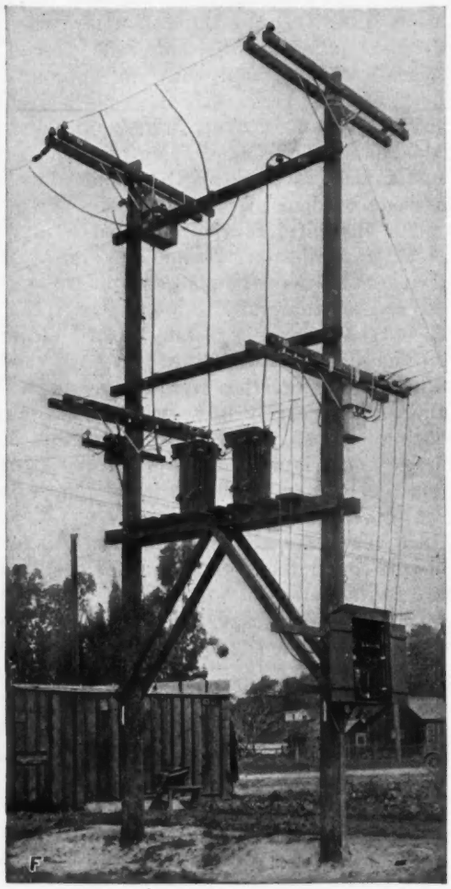




Fig. 3—A—Indoor-type instrument transformers for a 15,000-volt metering installation placed in a metal box the details of which are shown in Fig. 1. The meter is placed in a box at the foot of the pole. On the pole in the background may be seen the arrangements for testing. B—15,000-volt installation using outdoor-type instrument with wooden box containing meter at the foot of the pole. C and D—Residence metering equipment placed outside of house. F—2,200-volt meter installation with the meter and transformers in wooden box, a detail of which is shown in E. Note the primary testing panel in upper left-hand corner.

TABLE II—RELATIVE COSTS OF OUTDOOR METERING EQUIPMENT FOR 10,000-VOLT AND 15,000-VOLT POWER INSTALLATIONS

INDOOR-TYPE INSTRUMENT TRANSFORMERS

10,000-Volt Installation

| | |
|---|---|
| One galvanized-iron box for transformers | $201.00 |
| One weatherproof box for meter | 6.64 |
| Two 11,000/110-volt potential transformers, indoor type | 172.00 |
| Two 75/5-amp., 11,000-volt current transformers, indoor type | 92.50 |
| Six R.E.C. disconnecting switches | 62.91 |
| Instrument wire, conduit, condulets, etc. | 15.00 |
| Cross-arms, insulators and hardware | 35.00 |
| One 50-ft. pole | 33.45 |
| One ground | 5.40 |
| 300 ft. No. 6 cotton-covered wire, 10,000-volt | 63.60 |
| Labor and overhead | 100.00 |
| Cartage | 10.00 |
| Total | $797.50 |

15,000-Volt Installation

| | |
|---|---|
| One galvanized-iron box for transformers | $201.00 |
| One weatherproof box for meter | 6.64 |
| Two 16,500/110-volt potential transformers, indoor type | 259.70 |
| Two 50/5-amp., 15,000-volt current transformers, indoor type | 92.50 |
| Six R.E.C. disconnecting switches | 62.91 |
| Instrument wire, conduit, condulets, etc. | 15.00 |
| Cross-arms, insulators and hardware | 35.00 |
| One 50-ft. pole | 33.45 |
| One ground | 5.40 |
| 300 ft. No. 6 cotton-covered wire, 15,000-volt | 72.84 |
| Labor and overhead | 100.00 |
| Cartage | 10.00 |
| Total | $894.44 |

OUTDOOR-TYPE INSTRUMENT TRANSFORMERS

10,000-Volt Installation

| | |
|---|---|
| One weatherproof box for meter | $6.64 |
| Two 11,000/110-volt potential transformers, outdoor type | 238.50 |
| Two 75/5-amp., 15,000-volt current transformers, outdoor type | 136.04 |
| Six R.E.C. disconnecting switches | 62.91 |
| Instrument wire, conduit, condulets, etc. | 15.00 |
| Cross-arms, insulators and hardware | 10.00 |
| One ground | 5.40 |
| 150 ft. No. 6 cotton-covered wire, 10,000-volt | 27.80 |
| Labor and overhead | 50.00 |
| Cartage | 5.00 |
| Total | $557.29 |

15,000-Volt Installation

| | |
|---|---|
| One weatherproof box for meter | $6.64 |
| Two 16,500/110-volt, 200-watt potential transformers, outdoor type | 362.32 |
| Two 50/5-amp., 15,000-volt current transformers, outdoor type | 136.04 |
| Six R.E.C. disconnecting switches | 62.91 |
| Instrument wire, conduit, condulet, etc. | 15.00 |
| Cross-arms, insulators and hardware | 10.00 |
| One ground | 5.40 |
| 150 ft. No. 6 cotton-covered wire, 15,000-volt | 36.42 |
| Labor and overhead | 50.00 |
| Cartage | 5.00 |
| Total | $689.73 |

of the higher voltages, as it is quite feasible to place 2,200-volt equipment in a wooden box. The use of such a box for 11,000-volt or 15,000-volt current and potential transformers is inadvisable, the danger of fire being greatly increased.

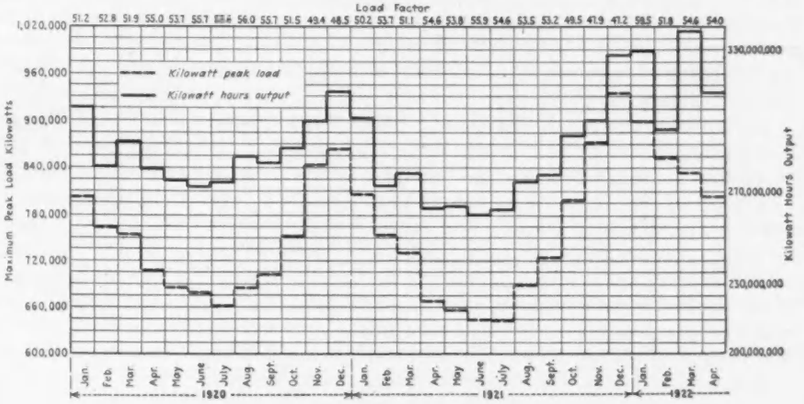
A box containing all equipment for a 2,200-volt installation, including meter, current and potential transformers and a testing panel for "over-all" tests, is illustrated in Fig. 3 E and F. This box is wired up in the meter department complete with meter and shipped to the place of installation. The cost of the complete installation, with the exception of the meter, including labor of placing on pole and connecting up, is shown in Table I.

The 10,000-volt and 15,000-volt equipment must necessarily be high enough to minimize the possibility of outsiders coming into accidental contact with it. Where indoor-type transformers are used, the galvanized-iron box illustrated in Figs. 1 and 3 A has proved very satisfactory. The meter is not in the iron box, but in a wooden box about 6 ft. from the ground, the secondaries being run down the pole in conduit. The iron box is made to order by local cornice works and delivered to the company's shops, where it is fitted with its angle-iron supports, insulators for connecting wires and frame for holding current transformers in the upper part of box. The potential transformers rest on the bottom. In testing primary metering apparatus for these voltages the scheme shown in Fig. 2 meets all requirements very well. Table II compares the total cost of constructing such an installation for 10,000 and for 15,000 volts.

Outdoor transformers are, of course, preferable when available, as the box may be dispensed with as well as the extra pole necessary for its support. Fig. 3 B illustrates such an installation. On account of the small amount of room available for high-voltage equipment at this particular plant, the outdoor metering proved particularly advantageous. The approximate cost of this type of metering installation is given in Table II. The tables give the approximate cost of the meter installation exclusive of the meter itself. Only such equipment is included as is fairly chargeable to the installation or testing of the meter. A capacity of 150 kw. is assumed for the 2,200-volt installation and 1,000 kw. for the higher voltages.

## Load Grows in Middle West

THE accompanying curves show the combined output of a number of central stations in the Middle West, giving the peak load and also the kilowatt-hour output for a period from Jan. 1, 1920, through April, 1922. These curves are plotted from compilations made by the Chicago office of the Westinghouse Electric & Manufacturing Company. This curve shows a considerable increase both in peak load and output over the same period a year ago. It is interesting to note that the central stations are rapidly regaining the load lost some time ago, if in fact they have not already recovered it all. A very large increase is also shown in the output for the year 1922 over both 1920 and 1921. The average load factor of these companies is also given, the highest load factor being that of January of this year, when it was reported as 59.5 per cent.




COMBINED OUTPUT AND LOAD OF FOURTEEN CENTRAL STATIONS IN THE MIDDLE WEST

# The Storeroom Solution on a Scattered System

## Oklahoma Gas & Electric Company Organizes a Supply Handling System for Its Oklahoma Properties—Accuracy and Service Aimed at—Special Attention Given Storage and Arrangement of Materials

By PAUL HOHEISEL

*Accountant Stores Department, Oklahoma Gas & Electric Company*

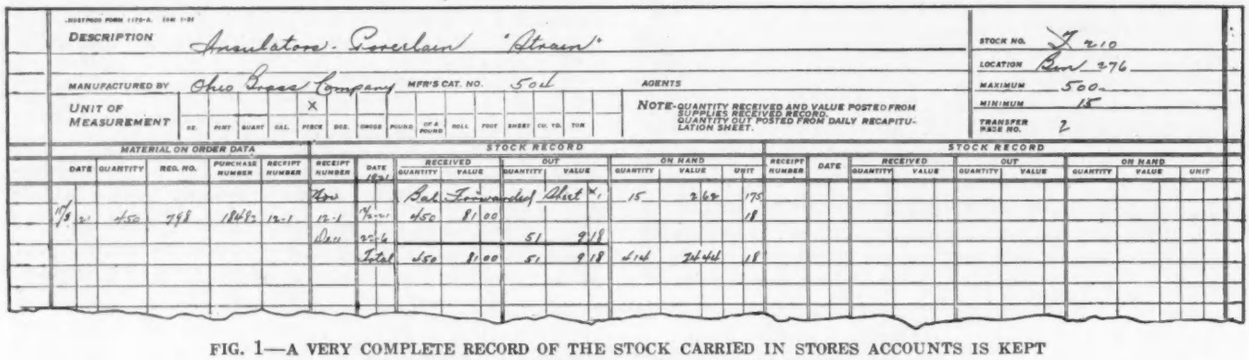
THE stores organization of the Oklahoma Gas & Electric Company, which operates properties well distributed over the entire state of Oklahoma, has been within the past year reconstructed, with results that have been exceptionally satisfactory. The seven storerooms of the system are now operating economically and in perfect harmony with all departments. Much effort has been concentrated on perfection of these four important features: The reducing of all stocks to the minimum practical supply, the standardization of materials, the installation of an accounting system and the establishment of a central storeroom at Oklahoma City.

In the minimizing of stocks, the need was to secure both reduction and the retention of the reduction. To obtain the reduction, the several foremen were instructed to use all of the inactive materials that would be practical in maintenance work. The storekeepers were instructed to ascertain whether or not there were articles in the stores bins that would substitute for items which they were about to restock, and if so to postpone the restocking until the substitute was used. Inventories were taken of all inactive and overstocked materials and lists of these sent to the other storerooms. In this manner much of the surplus of one store was transferred to relieve the deficit of another.

Such material as could not be transferred was sent from the closer stores to the central storeroom. The more remote storerooms furnished the general purchasing agent with lists of their surplus and placed it at his disposal. The turnover of each item of stock was carefully studied and a maximum and minimum quantity list made. At the central storeroom this was made on the basis of a three months' supply and at the branch storerooms on the basis of two months. The storekeepers were instructed to place requisitions as nearly within the scope of the listed quantities as possible, deviating only for special conditions which demanded an excess.

Retention of reduction, of course, is aided greatly by standardization of materials. The same types of crossarms, insulators and pole line hardware are used throughout the system. This applies also to pipe and fittings used in gas line repairs and extensions. Standardization was effected through the co-operation of the general superintendents of departments and is maintained by them, to the extent that each must personally approve all requisitions for supplies affecting his department before purchase is made. Thus they are in a position to know the style and quantity of the materials desired by their storeroom.

Standardization has very greatly reduced the variety of stores, made more bin space available in the storeroom and eliminated much uncertainty in accounting. The main feature is that the storeroom is able to keep a substantial stock of one type of material that will fill the same requirements of half a dozen miscellaneous items, possibly ordered for trial.


DESCRIPTION Insulators - Porcelain "Strain"

STOCK NO. 7-210

MANUFACTURED BY Ohio Brass Company MFR'S CAT. NO. 501

AGENTS

LOCATION Bin 276

MAXIMUM 500

MINIMUM 15

TRANSFER PAGE NO. 2

UNIT OF MEASUREMENT: OZ. PINT QUART GAL. X PIECE DOZ. GROSS POUND C OF A POUND ROLL FOOT SHEET CU. YD. TON

NOTE-QUANTITY RECEIVED AND VALUE POSTED FROM SUPPLIES RECEIVED RECORD. QUANTITY OUT POSTED FROM DAILY RECAPITULATION SHEET.

| MATERIAL ON ORDER DATA | | | | | STOCK RECORD | | | | | | | | STOCK RECORD | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | QUANTITY | REQ. NO. | PURCHASE NUMBER | RECEIPT NUMBER | RECEIPT NUMBER | DATE | RECEIVED QUANTITY | RECEIVED VALUE | OUT QUANTITY | OUT VALUE | ON HAND QUANTITY | ON HAND VALUE | ON HAND UNIT | RECEIPT NUMBER | DATE | RECEIVED QUANTITY | RECEIVED VALUE | OUT QUANTITY | OUT VALUE | ON HAND QUANTITY | ON HAND VALUE | ON HAND UNIT |
| | | | | | Bal. Forwarded | | | | Used | | 15 | 2.64 | 175 | | | | | | | | | |
| 7/8 | 2 | 450 | 788 | 18483 | 12-1 | 7/11 | 450 | 81.00 | | | | | 18 | | | | | | | | | |
| | | | | | Rec'd | 9/26 | | | 51 | 9.18 | | | | | | | | | | | | |
| | | | | | | Total | 450 | 81.00 | 51 | 9.18 | 414 | 74.46 | 18 | | | | | | | | | |

FIG. 1—A VERY COMPLETE RECORD OF THE STOCK CARRIED IN STORES ACCOUNTS IS KEPT ON THE SYSTEM OF THE OKLAHOMA GAS & ELECTRIC COMPANY

This form is used. The entries show the method of handling the accounts and the way in which the classification of material is carried out. The exact location in the storeroom is shown and the maximum and minimum stock quantities are carried for the guidance of the storekeeper in requisitioning additional supplies and keeping stocks at their proper levels.

### THE ACCOUNTING SYSTEM

The accounting system is complete and thorough. The transactions for each item are carefully followed from the time of receipt until disbursement. If the theory of the system is strictly carried out, no clerical error could avoid detection.

The materials are divided into three general accounts, namely: Material and supplies, transient stores and unclassified construction supplies.

The material and supplies account embraces all of the

standard materials used in operation and construction, with the exception of meters and transformers. For the purpose of analysis, this account is divided into twelve classifications, each symbolized by an alphabetical letter, and titled according to the materials they embrace:

| Classification | Classification |
|---|---|
| A—Fuel oil. | H—Plant parts and supplies. |
| B—Lubricating oil. | I—Automobile repairs and accessories. |
| C—Lime and soda ash. | J—Pipe. |
| D—Poles. | K—Fittings. |
| E—Wire. | L—Other gas supplies. |
| F—Pole line hardware. | |
| G—Other electrical supplies. | |

The classifications are set up separately in the stock ledgers in such a manner that a distinct report can be made of each. By comparison of these accounts, it is determined which classifications are not in proportion to the operations of their governing departments.

The unclassified construction supplies account contains all electric meters and transformers, gas meters and regulators. The transactions of this account are handled in the same manner as those of the material and supplies account.

The central storeroom provides from an outside source sustenance for the entire organization. It is so organized as to be at any time prepared to increase or decrease stock according to the activities of the other departments. While under the control of the auditing and operating departments, it is in constant touch with the purchasing department to insure proper consideration of price and supply in replenishing.

The management, realizing the need of safeguarding stores, has spent much money in making the central storeroom an efficient model for the branch stores. It is given distinct, constant and keen supervision by a department head or storekeeper. He is rated with other department heads and subject to the same administrative control.

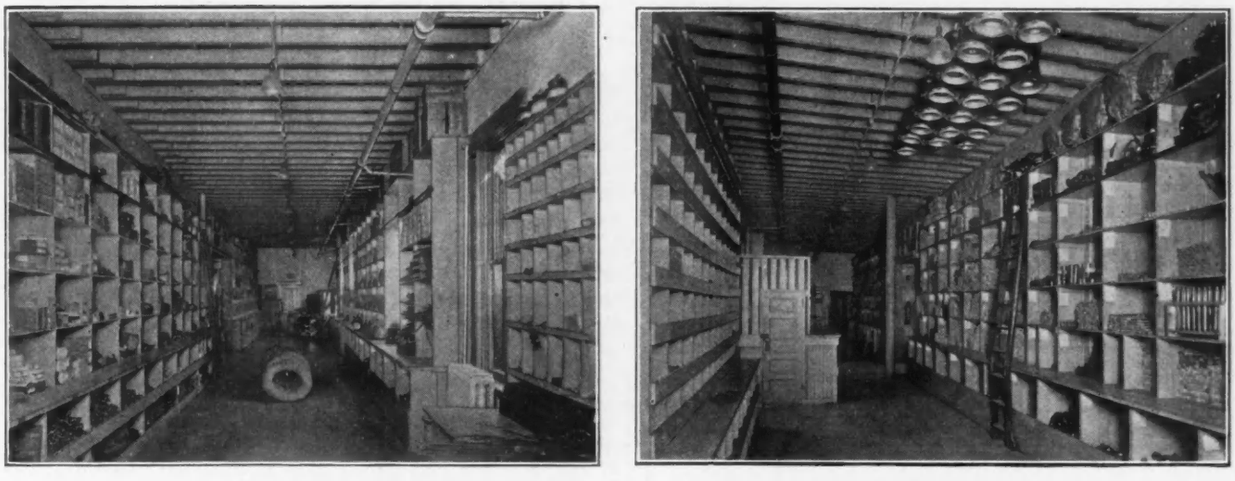


FIG. 2—AN ESSENTIAL OF AN EFFICIENT STOREROOM IS ORDER IN THE STORAGE OF STOCK

These illustrations show how the problem is handled in the main storeroom of the Oklahoma Gas & Electric Company. Material is not allowed to accumulate in the aisles even when new shipments are received. A space is provided for the handling of shipments away from the stock storage. Each bin is marked, similar items are grouped together and the articles in each bin are neatly arranged for quick handling and checking of stock. Service is one of the aims of the organization, so that unnecessary loitering on the part of employees securing material from stock is eliminated and much time saved.

All transactions of the material and supplies account are handled in stock ledgers. Every article of material is set up as a distinct account and the account numbered (Fig. 1). This account number, with the alphabetical prefix of the classification in which it appears, forms the symbol by which the article is identified in future receipts and disbursements.

The stock ledgers contain the controlling figures of each account, which, when totaled, agree with the general office ledger balance. Each account presents a detailed description of the material it represents, designating the trade name, manufacturer, catalog number, unit of measure, maximum and minimum quantity and location of material in the storeroom. Spaces are provided for material order data, material received, material checked out and balance on hand.

A transient stores account was established to account for incidental items purchased for immediate use. To open new accounts on the stock ledgers for the many and various articles not standard to operations would cause much extra effort without satisfactory results. Transient stores materials are recorded in a receiving ledger. From this ledger the accounts are charged against the proper operations and the ledger cleared.

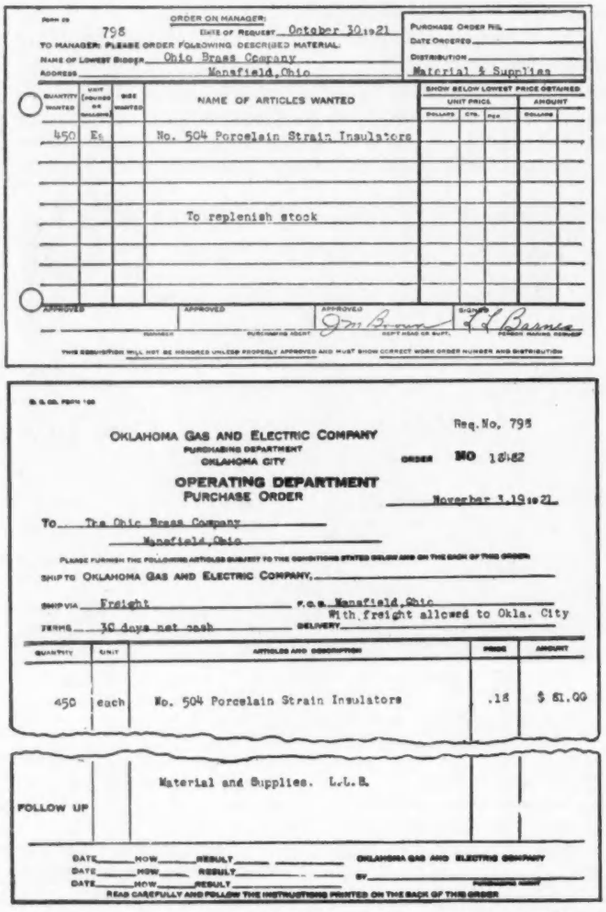
It is operated on the principle of co-operation with the other departments. Every effort is extended to furnish each with a complete stock necessary for operation.

The stores clerks are taught the meaning of service. Requisitions for supplies are cared for promptly and correctly. Materials are thought of as money by the entire department and every article of stock is cared for with almost the same degree of precision. Orderliness is an essential upon which great stress is laid. Material awaiting disposal in bins or on shelves is not left to accumulate in aisles or at the receiving point (Fig. 2). Everything has its place and is in its place. A complete card index is kept showing the name, description, bin number and symbol number of every article of stock. Thus a new clerk can be directed to any desired article of which he has had no previous knowledge. Adequate receiving space is prepared in a portion of the storeroom, apart from the delivery section, where special and undivided care can be given all incoming materials. The storeroom is provided with proper equipment such as bins, shelves, racks, lifting and conveying apparatus and scales.

The stock arrangement is such that articles having similar characteristics are stored in adjacent bins. Every

bin is numbered and is equipped with a metal holder containing a card showing a complete description of the material therein. All materials of a nature to permit uniform arrangement are placed in their respective bins so that almost at a glance one can determine the stock on hand.

Orderliness in arrangement enables the storeroom to handle quickly and in a businesslike manner all requisitions presented by messengers of the several departments. Every effort is made to avoid delays which encourage loitering at the delivery window. In disbursing materials nothing is allowed to be taken from the storeroom without a written order or requisition signed by a department head or his authorized agent. Each article in stock is designated by a standard symbol. This symbol is shown on the proper bin tag and on the stock records. Without this symbol there would be much uncertainty as to the identity of an item shown on a requisition due to the several different terms used by the different requisitioning authorities.



ORDER ON MANAGER: 795
DATE OF REQUEST October 30, 1921
TO MANAGER: PLEASE ORDER FOLLOWING DESCRIBED MATERIAL:
NAME OF LOWEST BIDDER Ohio Brass Company
ADDRESS Mansfield, Ohio
PURCHASE ORDER NO.
DATE ORDERED
DISTRIBUTION Material & Supplies

| QUANTITY WANTED | UNIT (PACKED AS SHIPPED) | SIZE WANTED | NAME OF ARTICLES WANTED | SHOW BELOW LOWEST PRICE OBTAINED UNIT PRICE DOLLARS | CTS. | MILS | AMOUNT DOLLARS | CTS. |
|---|---|---|---|---|---|---|---|---|
| 450 | Ea | | No. 504 Porcelain Strain Insulators | | | | | |
| | | | To replenish stock | | | | | |

APPROVED ... APPROVED ... APPROVED Jas Brown ... SIGNED L L Barnes

THIS REQUISITION WILL NOT BE HONORED UNLESS PROPERLY APPROVED AND MUST SHOW CORRECT WORK ORDER NUMBER AND DISTRIBUTION

OKLAHOMA GAS AND ELECTRIC COMPANY
PURCHASING DEPARTMENT
OKLAHOMA CITY

Req. No. 795
ORDER NO 18482

OPERATING DEPARTMENT
PURCHASE ORDER

November 3, 1921

To The Ohio Brass Company
Mansfield, Ohio

PLEASE FURNISH THE FOLLOWING ARTICLES SUBJECT TO THE CONDITIONS STATED BELOW AND ON THE BACK OF THIS ORDER.

SHIP TO OKLAHOMA GAS AND ELECTRIC COMPANY,

SHIP VIA Freight F.O.B. Mansfield, Ohio
With freight allowed to Okla. City

TERMS 30 days net cash DELIVERY

| QUANTITY | UNIT | ARTICLES AND DESCRIPTION | PRICE | AMOUNT |
|---|---|---|---|---|
| 450 | each | No. 504 Porcelain Strain Insulators | .18 | $ 81.00 |

FOLLOW UP

Material and Supplies. L.L.B.

DATE ... HOW ... RESULT ... OKLAHOMA GAS AND ELECTRIC COMPANY
DATE ... HOW ... RESULT ... BY
DATE ... HOW ... RESULT ... PURCHASING AGENT

READ CAREFULLY AND FOLLOW THE INSTRUCTIONS PRINTED ON THE BACK OF THIS ORDER

FIG. 3—FORM OF REQUEST FOR ORDER AND THE PURCHASE ORDER USED BY THE OKLAHOMA GAS & ELECTRIC COMPANY

## STOCK UPKEEP

It is the endeavor of the storeroom to keep an adequate supply for the current operations. When the supply becomes inadequate the dependent operators are weakened. As the stocks become overabundant the department is functioning inefficiently. Thus great care is given to intelligent replenishment. The standardization of materials has been of great assistance in stock maintenance, in that the variety of articles has been reduced. Established limits for maximum and minimum quantities for every standard item are the basis of the entire stores structure. These limits were established after a thorough analysis of each item by counsel with the purchasing and operating departments.

The term "minimum" is used to denote the lowest quantity that a stock item should be allowed to reach. Thus it is necessary to restock before the quantities reach that point, but not restock to over-reach the maximum limit, or the normal condition of the stores. The quantities between the limits at the present time represent about a three months' supply, with the exception of wire, poles and such materials as are purchased in carload lots.

The stock clerks are trained to be ever on the alert for materials reaching the ordering point. A report is made of these in a form of a want book, wherein is recorded the date, description of the material and the quantity on hand. The head stockman frequently consults this report and makes requisitions on the purchasing department for the needed items.

Before the requisition leaves the storeroom, the quantity shown as being on hand is compared with the stock record figure. If there is any difference, it leads to an investigation, which in turn leads to the righting of some wrong. It provides a special form of perpetual inventory, of which there cannot be too much use in any storeroom. Very often it is found that a new clerk is not aware of the storage in the warehouse of some item which is running low in the storeroom bins. By check to the stock records a large difference will be shown which will lead to the discovery of this reserve and eliminate the necessity of restocking.

## REQUISITIONING

The requisition on the storeroom is made in duplicate. After stock record comparison, both copies are delivered to the storekeeper, who signs them, retains the duplicate and sends the original to the superintendent of the department which will use the material upon receipt. The storekeeper's duplicate copy is filed and is a reference for materials on order with the purchasing department. The original copies are sent to the department heads so that they may note the quantities and styles of materials being requisitioned. Upon being approved at this point, the requisition is returned to the storeroom and thence to the purchasing department.

At the time the purchase papers are made, two copies of the order (Fig. 3) are sent to the storeroom. One is for the receiving department and the other for file as reference to materials on order. As the purchase order copies are received, the storeroom requisition file is cleared and attached to the purchase copies. Data on these are entered under the proper accounts in the stock ledgers to show the date of order, quantity requisition and purchase numbers.

On the receiving copy of the purchase order, after each item, the ledger account number or stock symbol is entered, which symbol is to be used by the receiving clerk in the labeling of all materials at the time of receipt. Thus proper identification is made from the beginning. In the event of material which is ordered for immediate use and is not to be carried on the stock ledgers, the purchase order entry is made in a looseleaf ring book, according to the alphabetical arrangement of the material name. The receiving copy in this case is stamped "Transient Stores" and is to be handled accordingly by the receiving clerk.

# What I Found Out on a Residence Survey

## Some Personal Experiences in Investigating Residence Service Conditions with a Few Suggestions that Come Out of It— Getting the "Feel" of the Public

By CLARA H. ZILLESSEN
*Advertising Department, Philadelphia Electric Company*

IT IS an interesting thing sometimes to put your finger out and for a minute personally get the "feel" of the public that we talk so much about. The residence survey offers such an opportunity, although it does not always provide it in full measure. The survey man is apt to be intent on getting the job done and eager to fill his card and be gone quickly. But it takes a bit of time, with patience, comprehensive purpose and an understanding mind, to really make the friendly contact that is necessary if the full part that electricity is playing in the habits of each home is to be found out. Miss Zillessen has an unusual background and an eager interest, and her experience on the Philadelphia survey gives reflections of conditions as they are that are worth pondering.

DOFFING the shell - rimmed spectacles which are the outward manifestations of the fact that I am an advertising writer, and donning the identification badge and portfolio of the regular members of our survey squad, I recently sallied forth on a doorbell-pulling adventure in search of sales and advertising data on that mysterious and elusive element which we know as "the public." Our company is making a partial survey in certain districts of Philadelphia of commercial and residential properties—mostly the latter. It has primarily the purpose of definitely locating potential business, but also of obtaining accurate and first-hand information regarding our customers' knowledge of certain company policies and their feeling toward the company in general.

So with my fingers crossed and a new pair of rubber heels on my most comfortable shoes I started out. The first move was to disarm possible suspicion with as heartfelt a smile as could be mustered; then to identify myself and declare my errand—to wit, to ascertain if service, lights and so on were satisfactory; next, to gather data regarding sizes of lamps used, appliances and number of hours' use per week and similar miscellaneous information, all of which was duly recorded. I took my time and tried to ingratiate myself into the confidence of the housewife or house owner, so that they would talk to me fully and freely and without the self-consciousness people are apt to feel when being assailed with rapid-fire questions by the professional investigator.

The districts I "worked" might conveniently be classified into three types of properties. The first comprises houses which were built about twenty-five years ago and most of which have been wired within the last five years—the majority of them within the last year or two. Those living in them are probably people with incomes of $3,000 to $5,000 a year—conservative, quiet-living individuals, with parlors instead of living rooms, closely drawn shades and a sort of mausoleum air about the lower floor. You know the type!

Another class was of the small houses occupied apparently by people of very moderate means—clerks, machinists, printers and small storekeepers. These people live on a very close margin, but nearly all of them have one or more appliances. They have bought their homes already wired and obviously take their electric service as much for granted as they do their bathrooms.

The third type I interviewed were apparently a little higher up in the social scale, for these houses boasted of an occasional maid. These homes, too, were wired when built, and nearly all the occupants have cleaners and flatirons, at least. The mere fact that the occupants have more money, however, does not put them in the higher ranks of intelligence, as my story will show later on.

This survey work is rich in human contacts. You meet all kinds—busy mothers, society ladies, dear old grandmothers, indifferent maids, curious old granddads, noisy children, talkative folk, abrupt and sharp-spoken ones, kind people and some not so kind—all the types that go to make up this world of ours. Meeting customers face to face in their own homes certainly does provide a lot of curious high lights on the broad scope of electric service and how it has woven itself into the fabric of home life. But sometimes I used to get almost heartsick to see how many women there are who, with the means right at hand to live comfortably and happily, take years out of their lives, and waste precious energy, because they run their homes with no better tools than those to which their grandmothers were restricted.

### FLATIRON REACTIONS

My first few days on the survey were a constant surprise to me. I used to ring the doorbell of a house and think: "Well, I wonder what new thing is going to hit me now." I got a few serious shocks those first weeks. I was thoroughly "sold" on the idea of electric service in the home. We have all sorts of electric labor savers in my own home which are used to the limit. The idea of persons having these things and not using them therefore didn't fit into the picture at all.

I have never understood where all the electric flatirons that are sold go to. Thousands are sold every year and everybody seems to have one. Lots of people have two or three, and they usually treasure them as if they were worth their weight in gold. But every once in a while (and more often than you'd think) I came across some woman who hasn't bridged the gap between this generation and the last, who has an elec-

tric iron and deliberately either uses the old-fashioned iron herself or lets her maid do so. I tried hard to get at the mental attitude that would intentionally do an already hard job the hardest possible way, but it couldn't be done. People like that have shifters' minds —you drive home an argument one way and they dodge away. They shift to some other point, equally

VACUUM CLEANERS AND WASHERS ARE USED IN THESE HOMES

weak, from which they will slide as soon as your ammunition is trained there. I came to the conclusion that such women were practically walking in their sleep and that nothing short of explosive advertising would wake them.

I sold electric sweepers once from house to house when they first came on the market—when they were ugly big brutes to haul over a carpet, anything but the light, compact machines we have today. That early training instilled into my very marrow the absolute need for an electric cleaner in every home. I had cleaned too many so-called clean carpets for the first time with an electric cleaner, with the usual result of over a quart of dirt, to believe that a broom or carpet sweeper, no matter how vigorously wielded, can keep floor coverings really clean.

You can imagine my "reaction" when day-after-day questioning revealed that the majority of women are really not using their electric cleaners often enough. Certainly once a month will not keep carpets and rugs free from dirt, even though supplemented by unnecessarily hard broom cleaning. I used to tell these women that all the household experts say that the easiest way of taking care of a house is to "keep a clean house clean," that an electric cleaner should be used at least once a week, that hundreds of good housekeepers go over their rugs every second or third day, that estimates from all over the country indicate that the average family can make liberal use of an electric cleaner for a whole year for about $2.50 worth of electricity.

I remember one attractive frail little lady who lived in a good-sized house. We were talking about this question of cleaners, and I asked her how she used hers. "Well," she said, "once a month I go over the house thoroughly with the broom and then with my electric cleaner." Can you imagine it? There is nothing much harder for a woman than to sweep a whole house with a broom. But she had been habitually doing this, with a good cleaner, an expensive machine ready there in the home to do the work for her. There is only one explanation, and that is that the salesman had not sold her full confidence in the machine when she bought it.

### THE ANTIPATHETIC-SERVANT POSE

The thing that used to make me nearly explode with impatience was when somebody would tell me she didn't need an electric iron or an electric washer because she "had somebody to do the washing." Or she didn't need an electric cleaner because she had a good maid who didn't mind using the broom and carpet swepeer, was really "sot" against any electrically driven appliance. I have come to the conclusion, however, that a lot of this so-called objection among servants against electric labor savers is purely mythical and merely a wall behind which the employer intrenches herself because she would rather spend the money for something else.

It's usually the older generation that has this weird idea of not saving servant labor. I remember interviewing a mother and two daughters on the subject. It was one of those hot days of early spring and we were seated in the cool, pleasant living room. The mother said that they had an electric iron for light pressing upstairs, but that her maid used the old-fashioned ones and that she was at that very moment ironing the family wash. The daughters were obviously ashamed of this condition, realizing, as they did, the incongruity of their sitting idly in a cool, attractive room with the maid bending over the hot stove using an old-fashioned iron. The old lady militantly countered that she wasn't one to spoil her help by "puttin' a lot of new ideas in their heads." She had employed help for thirty years and she knew!

### WASHERS AND WIRING

And then the arguments about the electric clothes washer! All sorts of wild ideas—from fear of shock all the way down the line to the fact that they had *heard* a washer was hard on the clothes, and that it was cheaper to send them to the laundry. Over and over I told the same old story—the washer was easier on clothes than the hand method of rubbing; it was perfectly safe to use; it was demonstrably cheaper to use a washer than to send the things to the laundry.

You never could tell from the looks of a house, either, whether it might not have a complete electric laundry. A lot of cheaper houses had washers, because these people of limited means are used to buying on credit and many of them had bought their washers by the same method by which they had acquired their player-pianos and victrolas. These are the practical people, who are struggling to rear families and save money on limited incomes, and the housewives of this type will deny themselves to get a really efficient labor saver.

Looking over my records, I find relatively few houses called upon that were not wired for electric service. The very large majority of people owning their homes undoubtedly *want* electric service. There seems to be only one bugbear—the real or fancied expense and the general lack of knowledge as to just how much it will cost to wire the particular property in which they are interested. Judging from my survey of unwired houses, I should say that there are a lot of these "prospects" just sitting on the fence, waiting to be pushed off by means of a campaign on housewiring which will tell them definitely how much it will cost and how they can pay for it.

One condition I encountered that was rather surprising. The survey people are trying to educate our con-

sumers to use the proper size lamps, and they carry literature along this line which will be helpful. In raising this point as I went on with the work, I was astounded to find that nearly every woman knew just exactly what size lamps were being used in different parts of the house, naming them by wattage. Not once did I hear the word "candlepower." Together with a great

LEFT—SMALL HOUSES CLOSELY GROUPED FURNISH A GOOD BUSINESS. RIGHT—COST IS LESS FOR WIRING A GROUP OF SIMILAR HOUSES WHEN BUILT

many other persons, I had always believed that the women of the house were a bit vague about lamps and their sizes, and it was refreshing to find the very great majority of them using and knowing all about the proper tungsten lamps to use.

When a few days had passed after finishing this self-imposed task of surveying, my more or less chaotic impressions had simmered down to something like this:

### THINGS TO REMEMBER IN ADVERTISING AND SELLING HOUSEWIRING

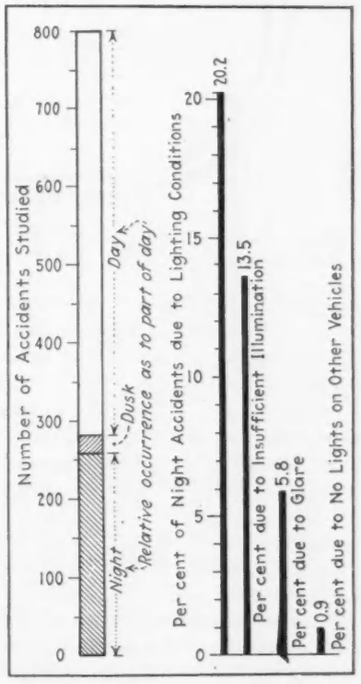
1. Find out definitely what kind of potential business there is along each line—where and what type of house and people you will have to deal with.
2. Get the cream of the business first. Talk a definite plan, prices and terms. This is important, for many house owners are "sold" on the idea of electric service, but have a vague and generally mistaken idea of price.
3. Get a set of wiring plans—nearly any of the model "electric home" plans will do—and give them broad distribution. Remember that nearly everybody—whether he or she has a home or not—is susceptible to the insidious attraction of playing with house plans.
4. Keep after neighbors and friends of people who have recently wired—they are splendid prospective customers.

### THINGS TO REMEMBER WHEN ADVERTISING AND MERCHANDISING APPLIANCES

1. Keep everlastingly at it. Repeat the fundamental facts of what the appliances will do and what they will save—their prices and selling terms—and keep on repeating and repeating until you think the public must be sick of the story. And then keep on repeating, for just about then slight glimmers of understanding will be evident.
2. Make your sales and advertising talk in plain, simple and everyday English. Use no "hifalutin'" language or "subtle stuff" which shows your nimble and agile mind, but bread-and-butter facts which every one can understand.
3. Be sure the appliance is properly sold. High-pressure salesmanship often sells appliances without the purchaser's being really confident. This is often the purchaser's fault, but the manufacturer's and distributor's salesmen should reckon with this fact and see that every purchaser thoroughly understands all the uses and the necessity for frequent use (when this is so). Both central stations and contractor-dealers will find this advice pertinent.
4. Make a mental classification of your merchandise. With the type on which the public is already thoroughly educated it is a matter of selling *your make*. The other class of appliances calls for educational work. To sell the first, talk terms, price, the points of your particular make. To sell the second, talk free trial, labor and time-saving qualities, then terms, and lastly price.

## Inadequate Highway Lighting an Accident Factor

GLARE from automobile headlights or other exposed light sources has for some time been looked upon as a conspicuous cause of night accidents on highways, but recent data obtained by Alfred W. Devine, head-lighting inspector at Boston for the Massachusetts Department of Public Works, indicate that a still more important factor in such occurrences may be the illumination of the roadways themselves. From the reports of departmental inspectors 800 motor-vehicle fatal and non-fatal accidents were analyzed, 400 during 1920 and 400 during 1921. Of these 522 occurred in daylight, 20 at dusk and 258 at night. Of the 258 night accidents 20.2 per cent were due to lighting conditions, nearly two-thirds being due to insufficient illumination. Slightly less than 5.8 per cent were due to glare, and 0.9 per cent to there being no lights on other vehicles. A new headlight law for motorists went into effect in August, 1921, in which special provision was made to reduce glare. During the four months from Dec. 1, 1920, there were 119 fatal motor-vehicle accidents in Massachusetts compared with ninety-four in the corresponding period a year later. This reduction of twenty-five, when it is further analyzed, shows that there were twenty-two fewer fatal accidents at night in the four months ended March 31, 1922, and indicates that the new lighting law is already proving beneficial, largely through eliminating glare from headlights.




MORE THAN 20 PER CENT OF AUTOMOBILE NIGHT ACCIDENTS ARE DUE TO LIGHTING CONDITIONS

# Letters from Our Readers

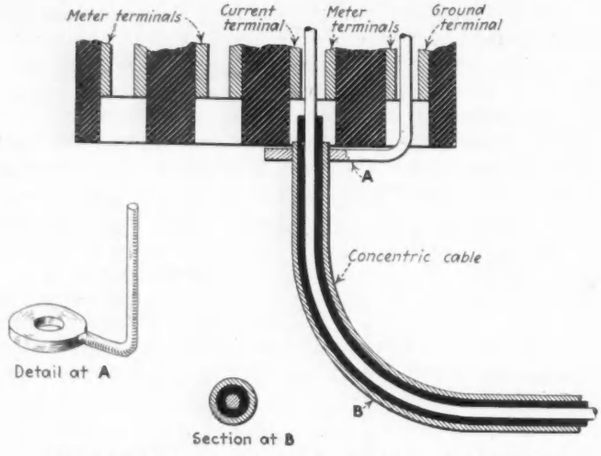
A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

## Preventing Theft of Electricity

*To the Editors of the Electrical World:*

Will you permit me to describe a method which has been developed for preventing the theft of electrical energy in a community where it is all too common? This method is applicable to single-phase instruments used on grounded systems (such as the widely used three-phase, four-wire system) and is the outcome of an experience lasting over several years in a city having 35,000 metered installations and where no less than fifteen different ways of "beating the meter" have been discovered. Although partial protection can be given by a complete rigid conduit installation, this is not only costly, both in material and labor, but is not so effective as the much cheaper method to be described.

Proper protection of the instruments can be attained




CONCENTRIC CABLE USED IN METER SERVICE TO PREVENT THEFT OF ELECTRICITY

by making three things impossible, namely: (1) Access to what will in future be called the "current" wire, to distinguish it from the "ground" wire; (2) access to the "current" terminal of the instrument; (3) reversal of the incoming leads. (This last is important, as when it is possible to reverse the leads the removal of one fuse and the making of an "artificial ground" in the interior installation will permit of the use of current without meter registration.)

In describing the method an ordinary watt-hour meter is used as an example, though it will be readily seen that other instruments such as time clocks, current-limiting devices, etc., can be protected in the same general manner. The method consists of a combination of concentric cable, connecting the supply company's wires or cable with the meter, and a simple terminal piece at the terminal board of the meter. A cross-section through the meter terminals, the cable and the terminal piece is shown. The concentric cable consists of a double wrapping, or sheath, of tinned copper tape surrounding an inner rubber-insulated conductor. In practice the outer sheath is braided and compounded in order to protect the metal.

The recommended manner of making the connections is the following: For a line connection the outer sheath of the cable should be bound to the "ground" wire of the system and there soldered; the sheath should then be stripped down to this point and clipped off, leaving a sufficient length of the insulated current wire projecting to connect with the phase wire. Thus made, it will be seen that, mechanically, reversal of the leads is practically impossible without easy detection.

The connection to the meter is made as follows: The required amount of braiding is removed, and the terminal piece is slipped over the sheathing and soldered to it. The copper sheath is then stripped down to this point and clipped off as before. Sufficient of the insulation of the inner wire is then removed in order to allow it to enter the "current" terminal. The projection on the terminal piece is now bent up so as properly to enter the "ground" terminal, and the two conductors are firmly clamped in their respective holders by the screws provided for the purpose. The job is now completed, except that if the ground terminal of the meter is not grounded, the cable sheath will have to be grounded at some convenient point.

This new method, then, makes access to the interior or "current" wire impossible; second, no pin or wire can be pushed into the current terminal of the meter, as the plate covers it and cannot be moved, and, third, reversal of the leads is mechanically difficult, and when the sheath is grounded, electrically impossible without causing a dead ground.

The cost of the cable (for installations up to 2,000 watts) is approximately 6 cents per foot, and that of the terminal piece 50 cents. Both articles are sold by the W. T. Henleys Telegraph Works, Ltd., London. Although the cost of the material is low compared with that required for a conduit installation, the greatest economy is found in the labor item as the connection is of the simplest character.

J. A. E. REYNOLDS,
Mexico, Mex. Electrical Engineer.

## Tribute to Clifford D. Babcock

*To the Editors of the Electrical World:*

I was grieved to read in a recent issue of your paper of the death of Clifford Dudley Babcock. He came to me almost at the beginning of my work in wireless and was for years a most efficient and helpful assistant. He was unquestionably the hardest worker I ever knew, regarding neither rest, food nor sleep when work was to be done. He was ingenious and resourceful to an unusual degree. His mind was truly encyclopedic, his memory marvelous. An omnivorous reader of scientific papers, he could, with uncanny precision, recall dates, data and circumstances of experiments done by himself or read years previously. His advice and encouragement during the early work which led up to the audion were invaluable. It was Babcock who gave this device its name.

His example in industry and cheerfulness was a ceaseless inspiration, not only to me but to many others associated with us in those early days of American wireless. "Bab," as he was affectionately known in older radio circles, always fought an uphill battle against heavy odds, yet was ever cheerful, never discouraged. His memory will long be cherished among large numbers of wireless pioneers, with whose names that of C. D. Babcock must always be inscribed.

Berlin. LEE DE FOREST.

# Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

## Carrier-Current Communication Through Cable

EXPERIMENTS on the Commonwealth Edison Company's underground cable systems for carrying high-frequency currents indicate that, while satisfactory for short distances, this method of communication is still in the experimental stage for longer distances. Further experiments must be conducted, investigating the effect of increasing the amount of power input and increasing the wave length. Since very little work had been done previously on transmitting high-frequency currents through underground cable systems, this company conducted the following tests in order to determine how electrostatic and radiation losses affected carrier-current transmission. However, tests conducted on both direct-current and alternating-current underground systems indicate that another step has been taken toward using utility lines as further means of service.

### Best Results Obtained with Long Waves

A transmitting set was first connected to the direct-current lines of the West Division Street substation through a 0.0003-mf. condenser to the positive side and to the ground bus of the station. This set, designed by E. H. Gager, an engineer of the company, consisted of a 10-watt phone transmitting set with four 5-watt tubes, two serving as oscillators and two as modulators, using a Heising modulation system with a Hartley oscillation circuit. The filaments were supplied with 7.5-volt, 60-cycle current and the plates with 500-volt direct current from a small motor generator. The receiving equipment was a Westinghouse regenerative-circuit detector and two-stage amplifier. With the receiving set several thousand feet from the transmitter, communication was satisfactory, conversation also could be received from an aërial and ground, though not so strongly. This indicates that considerable energy was being radiated, but the greater part of the energy undoubtedly went into the underground cable. The high-frequency output was 0.6 amp. at a wave length of 218 m. By moving the receiving set to a distance of 10,000 ft. and connecting it to a lamp socket in the Lydia Street substation, strong signals were received, with both good buzzer and good telephone modulation. Much better results, however, were obtained with a wave length of 625 m. Absorption losses appeared to be such as to limit communication to short distances when using wave lengths as low as 600 m. and with small amount of transmitting power.

Tests were next conducted on the 60-cycle, 12,000-volt cables by connecting the set to the secondary of the 12,000-volt transformer through a 0.0005-mf. condenser. With a radiation of 1.4 amp. at 600 m., voice and buzzer signals were heard satisfactorily at the Lake View substation. The set was connected through a lamp socket to the secondary of the distribution system over a distance of 35,000 ft. With the receiving set connected to an antenna parallel to the high-tension bus, signals were heard, but not so loud. The conducting medium for this test was first from the low-tension side of the 12,000-volt transformer, then to 35,000 ft. of three-conductor cable through a generating station to which are connected three other generating stations and all of the high-tension transmission cable system, then through a 12,000/4,000-volt transformer to the distributing circuit, and then down to 115-volt secondary circuits.

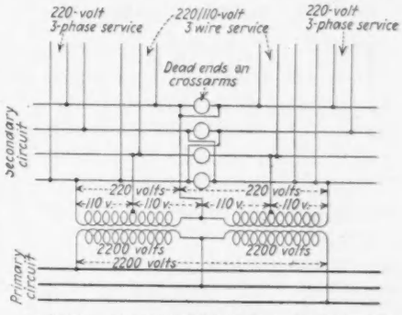
### More Investigation Essential

It must be remembered that these tests were conducted on a distribution system having a power capacity of 300,000 kw. and with cable whose characteristics on high frequency were unknown. While attempts to communicate over long distances are not yet successful, probably owing to short wave lengths and the small amount of power, it is believed that the increase of these factors, together with the results of research, will greatly increase the radius of satisfactory transmission. The results so far indicate sufficient possibilities to justify the continuation of investigation.

George M. Armbrust,
Electrical Engineer's Office.
Commonwealth Edison Company,
Chicago, Ill.

## Four-Wire System Used for Both Light and Power

THREE-PHASE, 220-volt power or single-phase, 220/110-volt light and power can be satisfactorily supplied from one bank of transformers connected in open delta with a secondary distributing system using but four wires. The arrangement employed by the St. Petersburg




FOUR-WIRE SYSTEM FOR THREE-PHASE POWER OR 220/110-VOLT LIGHTING CIRCUIT

(Fla.) Lighting Company for accomplishing this is shown in the accompanying diagram.

The wires are dead-ended on the transformer pole and the secondaries of the transformers connected as shown. Each transformer serves the single-phase, 220/110-volt lighting and power services in one direction only. This necessitates locating the transformer pole as near the center of this type of load as possible in order that the transformer may be properly balanced. The three-phase power load is supplied by the cross-connections shown.

While the efficiency as regards output to input is not as high as with the closed-delta system for three-phase, the transformers are in use nearly twenty-four hours of the day, with a good load practically all the time. The power load with some

lighting occurs during the day followed by the lighting load during the night. This combined loading cannot be obtained in purely power systems of day loads only or light systems of night loads only. With only four wires in the secondary mains, instead of the usual three for three-phase and three for 220/110 volts for single-phase, considerable copper is saved in the initial outlay of new mains, as well as space on a crowded pole.

The system is used to considerable extent in small cities and has proved very satisfactory where the motor load remains practically constant. For elevator motor and other motor loads which are continually started and stopped, causing voltage fluctuations, the system is not practical because of the effect produced on the light, the voltage of which should be kept unvarying.

M. A. WAGNER,
Assistant Superintendent Distribution.
St. Petersburg Lighting Company,
St. Petersburg, Fla.

## Water Rheostat that Absorbs 450 Kw.

TO FACILITATE a rating test on a generating unit a convenient home-made water rheostat was constructed by setting up a wooden tank about 12 ft. long by 6 ft. high and 3 ft. wide inside dimensions or giving a volume of 216 cu.ft. In the bottom were placed three iron plates about 16 in. square and ½ in. thick, bonded together with heavy copper cable. Three movable elements for connection to the three-phase taps from the generator bus were made of similar plates bolted through one corner to a wooden cross-arm, the latter being supported by block and tackle. The tank was filled with fresh water and sufficient salt added to give the required load with the plates submerged. During a preliminary test of one hour at an average load of 450 kw. the water boiled away so rapidly that it was not possible to hold the load steady for the last ten minutes. It was therefore arranged to overcome this difficulty by mounting a second tank near and above the main tank, installing piping so that fresh water could be supplied to compensate for the evaporation. Owing to the location, it was necessary to fence in the main tank. The material was picked up around the plant and the cost of construction was therefore light.

I. W. PHILLIPS,
Electrical Engineer.
Perry & Whipple, Mill Engineers,
Providence, R. I.

# Advocate Relay Simplicity and Systematic Maintenance

### Relative Merits of Differential Protection Discussed—Figures Given on the Economic Benefits of Protection in New Jersey System

THE paper on "Trend in Relay Protection" by Messrs. Hester, Conwell, Crichton and Traver (extracted on page 66 of the last issue) was commended most highly by various speakers at the Niagara Falls convention of the A.I.E.E. and referred to as a piece of work which has been greatly needed and the accomplishment of which will be widely appreciated. In the discussion almost every speaker emphasized the importance of simplicity of relay circuits and of systematic and thorough inspection and maintenance. Their proper application demands the close co-operation of manufacturer and operator. The discussion centered about the relative merits of differential protection. Some very interesting figures were also presented on the actual economic benefits which have been derived from increasing relay protection on the system in New Jersey.

A request for assistance from the membership at large was made by C. H. Sanderson in preparing the new relay handbook which is to be published this fall. He asked for suggestions as to subject matter to be included as well as the form of presentation.

According to some data which R. N. Conwell presented referring to thirteen substations on the New Jersey system, the total number of interruptions during a period of five years has been reduced from 270 to 21 by an earnest endeavor properly to apply and operate relays. During this period the total number of cases of trouble occurring has decreased from 288 to 130, indicating that the number of interruptions per case of trouble has been reduced from 0.94 to 0.16. In 1917 the revenue lost because of interruptions in these thirteen stations was $8,500, whereas in 1921 it was only $150. The capital expenditure for improving protection in these stations was $25,000. The fixed charges are $3,750, the cost of engineering, maintenance and testing $4,300, making the annual charges $8,050 per year. Inasmuch as $8,350 lost revenue was recovered through improved protection, this work netted the company $300 annual profit in 1921 aside from the beneficial influence on the public's attitude toward central-station service.

E. R. Stauffacher referred to the use of current-balance relays and a device for killing the field to localize the faults on a line where some mysterious flashovers occurred without apparent cause. He contended that the most effective and reliable relay applications can be made only through closer co-operation of manufacturers and operators.

While differential protection may have the disadvantage that it breaks the circuit before the current can drop off, R. Bailey said, it has the advantage of preventing the drop-

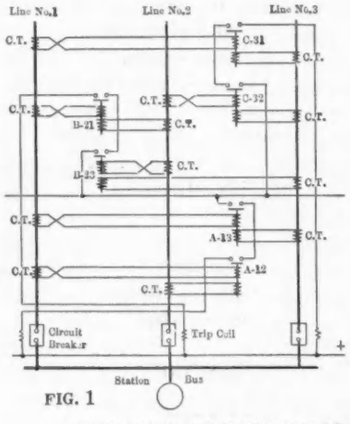



FIG. 1

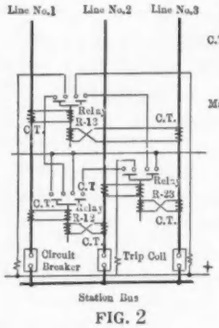



FIG. 2

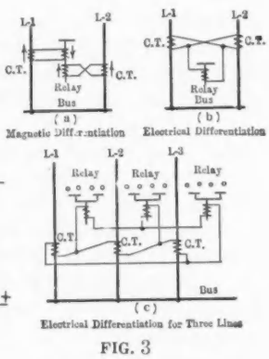



FIG. 3

NO BLOCKING RELAYS ARE REQUIRED FOR THESE METHODS OF PROTECTION

Fig. 1—Differential current relay system as used on three parallel lines. Fig. 2—Differential current relay system for three lines using one relay per line. Fig. 3—Methods of obtaining differentiation.

ping out of synchronous apparatus. Current balance or differential protection is best where several feeders are in parallel and is most difficult to use with double buses.

Paul Ackerman presented an extensive discussion on the merits of differential protection, which he opened by saying that he was glad that operating companies had the courage to depart from the old practice and that differential protection is becoming more popular. Back in 1912 the same objections were raised to differential protection that are raised in the paper that was extracted in the last issue. The best proof that these objections are not very serious is afforded by the fact that those who raised the most objections originally are today the most ardent supporters of differential protection.

### FAVORS DIFFERENTIAL RELAYS

Differential-current schemes are complicated, the speaker agreed, but the connections are made only once and, if properly installed, are permanent and safe. On the other hand, the relays are much more rugged than time-limit overload or directional relays. Although objections have been raised to having several relay contacts in series, not a single failure can be attributed to this cause, according to experience with several hundred relay installations in existence. Where blocking protection is embodied on double line protection, trouble may result if the current settings of the relays are very low. Attention was also called to the fact that open-circuited phases may trip the wrong line when differential-current schemes are used unless the relays are set higher than the total load fed by the two lines. However, this system has given practically 100 per cent effectiveness on single lines having copper wire, whereas only 80 per cent protection effectiveness has been obtained with aluminum lines.

Referring to the relay schemes shown in Figs. 1, 2 and 3 Mr. Atkinson pointed out that no blocking relays are required, and, despite the rather complicated wiring, the scheme can be made fairly simple if plan 3-C is used. He declared that it is particularly adaptable to underground distribution where substations are fed over three or more cables. The speaker declared that he had no sympathy for split-conductor and pilot-wire protection, except for lines less than one mile in length and for general and transformer protection. The ground selector performs on the underground system the same duty for which the neutral ground has been introduced.

Each system of protection and each individual problem must be considered separately, Mr. Ackerman concluded. To copy other companies' practices without careful analysis of their fitness to conditions under consideration may lead to disastrous results, he contended.

E. P. Peck pointed out that he has found it almost impossible to apply relays so they will function properly year in and year out on combined water-power and steam systems where the proportion of load carried by each station varies greatly. To keep the relays in proper operating condition they are tested every Saturday at midnight.

Refuting Mr. Ackerman's objection to split-conductor protection, W. H. Cole declared that this system has been operated to the extent of 600 mile-years in Boston with satisfaction. The only objection is extra cost, former objections having been eliminated.

Caution was urged by O. C. Traver in the use of high resistance neutral grounds because of their effect on relay operation.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

## Keeping Meter Statistics to Better Performance

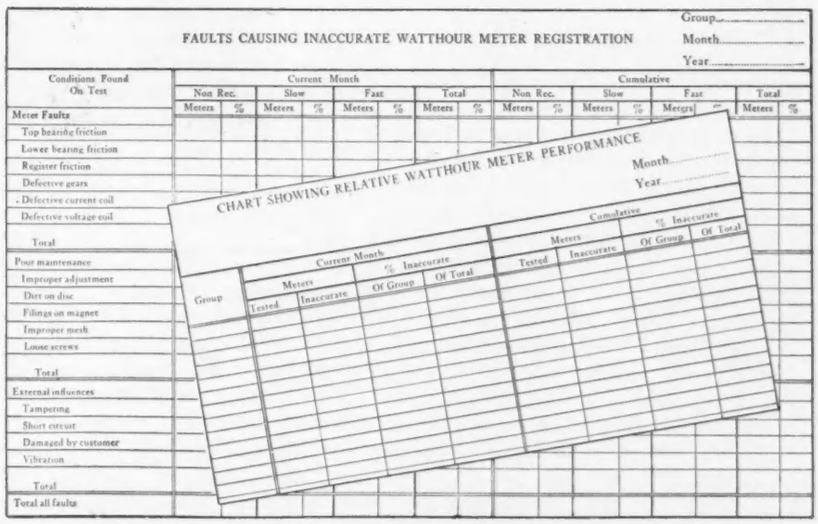
THAT an exceptionally large percentage of the watt-hour meters in this country are accurate is a fact known to the meter profession but frequently questioned by the public. Every utility manager and meter superintendent constantly strives to reduce the number of inaccurate meters, already small, to an insignificant figure.

There are many conditions that influence meter accuracy, and certain faults are quite common in some parts of the country that are unknown in others. Friction is the most common enemy of sustained accuracy, and all meters, regardless of their locality, are subject to error from this cause. Some faults are characteristic of only certain makes, types or sizes of meters, while other faults result from conditions at the point of installation.

Careful study is required in order to obtain a high degree of meter accuracy, and elaborate systems of records are kept by many companies for the purpose of analyzing faults.

A very useful system of records is one that shows the relative performance of the various types, sizes and makes of meters owned by the utility. Such a system will show at a glance the group that causes the downward tendency in the performance curve, facilitating the further analysis necessary to isolate and correct the fault. In conjunction with this system a record of all the faults causing errors in excess of the minimum set by the company should be kept. These records are particularly valuable for determining the frequency of test best suited for each group of meters and for formulating rules and regulations.

Meter faults can be tabulated under three major headings, poor maintenance, meter faults and external influences. For convenience in analyzing the data, records should be sectionalized according to whether




CHARTS THAT FACILITATE THE ANALYSIS OF METER INACCURACIES

the meters are fast, slow or stopped. The system outlined can be used to the best advantage after all the recurrent faults are known and have been listed. Forms can then be printed, and the only clerical work required will be the entering of totals in the respective columns and the conversion of the figures to a percentage basis.

A simple application of this system is shown in the two charts reproduced in the accompanying illustration. The smaller chart shows the performance of meters grouped in accordance with their make, type and rating, the letters A, B, C, D, etc., being used to designate the various groups. All the faults of the inaccurate meters in any one particular group are then segregated and filled in on the form shown in the other chart.

Referring to the first chart it can readily be seen which groups have a large percentage of inaccurate meters, both for the current month and for the year. Then by referring to the individual charts for each group the distribution of the inaccurate meters over the particular faults, such as top-bearing friction, register friction, poor maintenance, etc., can be seen.

Curves are often very useful for the study of meter performance and can be plotted readily from data compiled in the foregoing manner.

CHARLES W. EMERSON, JR.
General Foreman Meter and Test Department,
The United Electric Light & Power Co.,
New York, N. Y.

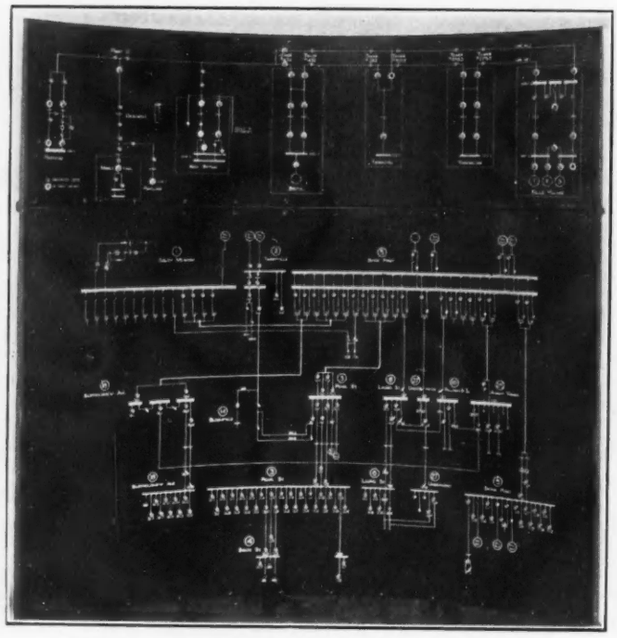
## Ratios for Determining Amortization Claims

RATIOS for determining replacement costs based on prices of June 30, 1916, have been computed by the Internal Revenue Service to facilitate the making of amortization claims. Some of the more important ratios are these: Lumber, hard, 240 per cent; lumber, soft, 175 per cent; structural steel, 60 per cent; building materials, other than lumber and structural steel, 225 per cent; steel other than structural steel, and steel products, 90 per cent; building equipment, 150 per cent; labor, all classes, 160 per cent; electrical machinery and equipment, 130 per cent; engines, turbines, compressors and similar facilities, 175 per cent; boilers, 160 per cent; all other machinery, including cranes, the cost of which did not exceed 10 cents per pound as of June 30, 1916, 120 per cent; machinery the cost of which did exceed 10 cents per pound as of June 30, 1916, 130 per cent.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

## Dispatcher's Board Using Plug and Tag Signals

CONTROL of the systems of the Connecticut Power Company and of the Hartford (Conn.) Electric Light Company by a single load dispatcher at the new South Meadow station of the latter is facilitated by the indicating board illustrated herewith. The board, made of sheet-iron ⅛ in. thick, is 3 ft. 9 in. long, with an upper section 15 in. high and a lower section 3 ft. 5 in. high. It is curved to a 36-in. radius and is mounted on a box frame. The upper section shows the lines and switches of the power company, which is interconnected with the Hartford system, and the lower section is assigned to the Hartford company.



TWO POWER SYSTEMS ARE CONTROLLED FROM THIS DISPATCHING BOARD

The board serves as a manually operated memorandum for the load dispatcher. It is laid out upon the single-line painted diagram basis, the 66,000-volt lines being shown at the top on the Connecticut system, and the 11,000-volt and 2,400-volt lines of the local company at the bottom.

Switches are indicated by ¼-in. holes. When the switch is closed a rubber plug is inserted in the hole. There are a few disconnecting switches used for insurance on the city lines. These are indicated by ⅛-in. holes, and a celluloid plug is used to show when the switch is closed. The power company is operated partly by oil switches and partly by disconnecting switches. All holes in the upper section board are ¼ in., and the oil switches are indicated by a ⅛-in. white rim about the hole. In case a circuit is out of commission for inspection or repairs, or if the disconnecting switches are open, a brass tag is hung in the corresponding hole. The switch on which it is hung cannot be closed without reference to a log sheet and the removal of the corresponding tag from the operating board. In each case when a switch is out of commission a tag stating the reason is inserted, and those interested are noted on the log and on a tag attached to the operating switch. The switch cannot be closed until every one affected has reported clear and the fact has been noted on the tag and the load dispatcher's log.

T. H. SOREN,
Vice-President.
Hartford (Conn.) Electric Light Company.

# Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

## Intensive Selling by Central Stations*

### How Electric Light and Power Companies Can Build Up Their New Business Departments and Increase Their Merchandise Sales

BY H. B. HINDON

SELLING merchandise today calls for a great deal of study and requires constant training to meet the many changes that are taking place in the marketing of goods. Today is the day of specializing and intensive selling methods, and must be coupled with well-placed high-grade advertising copy, one being directly dependent upon the other and essential to successful results.

Central station companies are facing the keenest competition in the merchandising of appliances they have ever had, and their commercial departments will be tested to the limit if they want to hold the lead. During the war period, gas and electric companies curtailed or discontinued their commercial departments and, in general, disrupted their entire selling organizations. Today they are paying for it in the loss of trade after having spent thousands of dollars in educating the public to use their service.

All over the country hundreds of appliance specialty stores are springing up that are adopting intensive selling methods, using well-planned big copy newspaper advertising, house to house canvassing, splendid window displays, together with long and very attractive terms both for cash and credit. They are hiring high-grade specialty salesmen and are paying them more attractive salaries and commissions than the gas and electric companies. The utility companies in general are not paying either the managers or salesmen in their new-business departments the proper salaries to meet this competition and are losing a lot of good men in consequence.

To overcome this growing competition, central stations will have to adopt intensive selling. Intensive selling means direct concentration on different appliances as the different seasons come into line, to be followed with enough advertising and selling effort to get the benefit of special sales during the balance of the year, as there is always a large number of created prospects from these sales that are allowed to die for lack of follow-up.

In order to reach any degree of success in this intensive or campaign method of selling and advertising, it is necessary to make out a strong, well-planned program and carry it through to the last minute of the time devoted to the sale, as the final closing will show the result of this planned and executed effort.

#### EMPLOYEES' INTEREST

In planning these sales it is necessary to sell the idea to your own organization first—that means everybody from the janitor to the president of your company. It is necessary to arouse every one's interest in the success of this effort and to impress them with the benefits of these sales. Holding meetings with shopmen, meter readers, collectors, salesmen, and every one who directly benefits by these sales, tends to arouse interest, as everybody likes to be identified with a busy, prosperous and going organization.

In the sale of the larger appliances too many companies are dilatory in their system of staging a campaign and lean too heavily on the manufacturer for results, when they should be the leader in the movement and have everything ready to go when the factory salesman appears on the job. Advance work should be done on everything, including advertising, window trimming, personal calls by company salesmen, arrangement of prospect lists and as much preparatory work as is possible, so that all the time may be devoted to closing, rather than creating live prospects.

Floor displays should be arranged so that the appliance to be specialized will appear strongly in evidence over everything else during time of sale. The volume display of goods always impresses the public with quantity buying power and assurance of quick delivery. Displaying goods in volume arouses interest and inquiries.

A sufficient stock should be carried so that immediate deliveries of appliances sold can be made. Possession of goods keeps down the percentage of cancellations, as delivered goods are not often returned.

Specialty men in an organization are a great asset and lead to greater volume of sales, for when a salesman talks, thinks and studies one or a few appliances, he becomes more expert in his selling arguments.

Working demonstrations are of great assistance, particularly outside or sidewalk displays, for then you can talk to ten while talking to one, for you usually have an audience.

Setting a sales quota and pledging your salesmen to produce a given number of sales, offering prizes to meter readers, collectors and shopmen for prospects turned in and from which sales are closed, all helps to put across big volume business.

Many appliance salesmen fall into the habit of following the line of least resistance and, unless they are checked up occasionally, they become mere order takers. Setting a quota for each salesman every month for the sale of larger and more revenue producing appliances on your lines is good practice and, just at this time, all companies should put more effort into a closer following up of building operations.

From a profit standpoint, the turnover on special sales is big, and if followed up properly, results in many more sales during the balance of the year. Summing it up, intensive selling will produce volume business if properly planned and followed up, but you must be organized in the right way to reach success.

*A paper presented at the meeting of the commercial section, Empire State Gas & Electric Association, at Lake George, N. Y.

## Introducing Electrical Appliances Through the Country Stores

BY EUGENE CARPENTER
Treasurer Cape & Vineyard Electric Company, Vineyard Haven, Mass.

ELEVEN towns in the Cape Cod district of Massachusetts are now being served by the Cape & Vineyard Electric Company, the territory being for the most part scattered and sparsely settled. With the exception of one town the company has built up its business from a standing start to a point where it now serves 6,000 customers, who paid a gross revenue in 1921 of $290,000. To develop this new business in such a territory at a cost which would not be prohibitive in the light of returns has required considerable careful planning on the part of the management.

In appliance distribution the company's policy has from the first emphasized the fullest co-operation with local dealers and contractors, who naturally receive the most protection and best prices from us. We decided as a first essential that the company should limit itself to the selling of electric service. This policy requires considerable attention to the marketing of appliances through local merchants.

We have endeavored to place a supply of electric lamps in every village store which formerly sold oil lamps, wicks, burners and kerosene. This gives these merchants a sort of substitute for the class of trade they were losing as a result of the development of house-wiring installations and the resultant purchasing of electrical conveniences. As for washing machines, we have tried to have every storekeeper (and there are many of these small merchants on Cape Cod) who had formerly handled washtubs, washboards, wringers, clothespins and clotheslines handle electric washers. We also have persuaded merchants who heretofore sold carpet sweepers, brooms, dust pans and brushes to put in a line of vacuum cleaners, and our own merchandising department acts simply as a wholesaler, doing business and soliciting but making no sales or deliveries direct to the user.

The results of this policy, while unsatisfactory at times in certain cases, have on the whole shown a tendency to improve with time, and today we can say that the plan is a success. We purchase electric pumping outfits in quantities and "peddle them out" to the plumbers in our territory. Load building through local merchants is aided by the advice of our staff, and we feel that these country stores and village business establishments are becoming more and more co-operative agencies in the development of electric service in our extended territory.

## Educating the Public in Accident Prevention

ACCIDENTS caused by people operating derricks, moving houses, using steam shovels or other similar equipment which may come in contact with light and power wires and cause serious or fatal injuries are a source of serious concern to power companies. Ordinarily such accidents are caused by the ignorance or carelessness of people in attempting to move the wires out of their way without calling on the company to send out experienced men to handle the conductors.

CONSUMERS POWER COMPANY
SAFETY BULLETIN
No. 6 JUNE, 1922

Recently a man who was assisting in moving a house in the vicinity of one of the transmission lines of Consumers Power Company attempted to lift up one of the high tension wires with a board in order to clear it from the building. In doing so he received serious injuries.

Other accidents of a similar kind have occurred. In one case a man was killed when moving a hay derrick under a power line.

While there is no legal liability upon the power companies for these accidents, superintendents, foremen and all employees should nevertheless do all they can to prevent them. Building moving contractors, road builders with steam shovels, men working with derricks, or hay stackers on the highways, or in the fields adjoining transmission lines, should be warned of the danger of passing under or near wires, and should be asked to pass the warning along to others.

A warning at the right time and place may save a life.

CENTRAL SAFETY COMMITTEE
JACKSON, MICHIGAN

CONSUMERS POWER COMPANY'S PUBLIC SAFETY POSTER

The Consumers Power Company is using the poster shown in the illustration in an educational campaign in the Michigan communities; it serves to prevent such accidents. In many cases such accidents have been found to be due to the fact that the man was actually ignorant that there was any danger in handling the wires. Educational campaigns pointing out the dangers involved in carelessness when working near such conductors seem to be worth while.

## What Other Companies Are Doing

**Brattleboro, Vt.**—The Twin State Gas & Electric Company in one week sold nine electric ranges, three washing machines, ten irons and other small appliances. The company has just closed a thirty-day campaign for sale of electric irons, during which period 225 irons were sold.

**Indianapolis, Ind.** — Appliances sold by the Interstate Public Service Company in one week were eleven vacuum cleaners, twenty-five irons, nine washing machines, one ironer, two curling irons, one sewing machine motor, three fans, two lighting fixtures, two electric cookers and four motors. Total sales for the week amounted to $5,538.62.

**Okmulgee, Okla.**—With a series of three luncheons during the past three weeks the Oklahoma power division of the American Public Service Company has entertained the local Rotary, Kiwanis and Lions' clubs in this city. The management took this opportunity to show these civic clubs the improvements recently completed at its plant.

**Illinois.**—Ninety-five per cent of the employees of the Central Illinois Public Service Company own stock in that company. In twelve offices or departments of the company the employee ownership is 100 per cent. Employees of the company are also active in selling the company's securities to customers.

**Boston, Mass.**—House wiring and appliance business reported by electric utilities managed by Charles H. Tenney & Company reflect marked improvement in economic conditions within recent months. In April and May 275 tenements were wired on the lines of the Fitchburg (Mass.) Gas & Electric Light Company, a gain of nearly 50 per cent over any other two consecutive months. A single contractor at Haverhill, Mass., wired twenty-eight houses in two months in the co-operative campaign being run by the Haverhill Electric Company. This company added ninety-six meters during May alone. The Malden (Mass.) Electric Company sold twenty washing machines in six days recently, and total appliance sales in the group of ten Tenney companies in the week ended June 3 were $14,935. Nine of these electric companies increased their total output during that week from 2,345,959 kw.-hr. in 1921 to 2,818,819 kw.-hr., or a gain of 20.1 per cent.

# Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

## Hydro-Electric Development and Steam Equipment

*Developments in Power-Station Design.*—Two surface condensers recently installed in the Bankside station of the City of London Electric Light Company, each designed to deal with 170,000 lb. of steam per hour, are described. Single-effect evaporators are used to supply the boiler make-up water.—*Engineer*, May 12, 1922.

*The Next Big Western Power Scheme.*—Active construction work is now under way on the Great Falls development, situated on the Winnipeg River, by the Manitoba (Canada) Power Company. When completed this hydro-electric installation will have a capacity of 56,000 hp. in two units. The complete capital cost will be less than $80 per horsepower.—*Electrical News*, April 15, 1922.

*Hydro-Electric Station at Mouthier.*—J. REYVAL.—A very detailed description of a new French hydro-electric plant with a present capacity of 12,000 hp. in three units of 4,000 hp. each, operating under a head of 122 m. Francis type turbines running at the unusually high speed of 750 r.p.m. are connected over a flywheel to 50-cycle, 3,500-kva., 5,500-volt three-phase generators. An indoor transforming station raises the machine voltage to 60,000 volts, which feeds a 300-km. transmission line to Besançon and Pontarlier. A number of 10,000-volt trunk lines radiate from the station to tie in with four neighboring plants.—*Revue Générale de l'Electricité*, May 13, 1922.

## Generation, Control and Switching

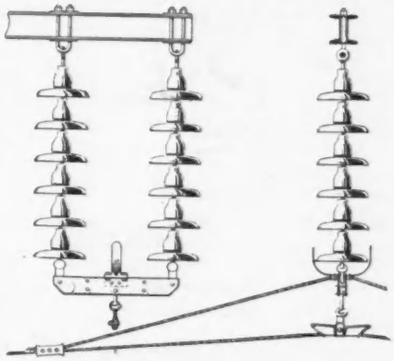
*Overvoltage Protective Apparatus.*—W. HOFFMANN.—This paper deals with the different methods of modern overvoltage protection for power lines up to 40,000 volts. The author describes the proper use of single and multiple horn-gap arresters, describes the design of resistors and mentions grounding choke coils. The latter are built like transformers with primary and secondary windings and are used as three-phase, star-wound types for three-phase lines or as single-phase coils for the "Y" point of a system.—*Siemens Zeitschrift*, April, 1922.

*High-Voltage Switchgear Design.*—W. A. COATES.—The problem of building electrical equipment for the high voltages which are now becoming common is mainly one of insulation. Two main types of insulation are required, that which merely supports the conductor, and that which insulates the conductor where it passes through a grounded body. The author discusses at length the details of modern outdoor switchgear compared with indoor equipment and points out its economic and engineering advantages. — *The Electrician*, May 5 and 12, 1922.

*Generators for Queenston-Chippawa Hydro-Electric Development.* — A description of generators Nos. 4 and 5 of this plant is given. They are three-phase, sixteen-pole machines, each rated at 45,000 kva., 187½ r.p.m., 12,000 volts, at a power factor of 80 per cent. They are of the vertical-shaft, revolving-field type, with spring thrust bearing, upper and lower guide bearings and direct connected exciter.—*Electrical News*, May 1, 1922.

## Transmission, Substations and Distribution

*A 100,000-Volt Line Through the Streets of Berlin.*—E. RÜHLE.—To add 20,000 kw. to the power supply of the northern parts of Berlin, without the installation of a new step-down transformer station, it was decided to extend a branch of the Golpa and Trattendorf 100,000-volt transmission line directly into the Moabit powerhouse, located near the very center of the city. Special safety precautions had to be taken for such an unprecedented right of way, because the streets traversed by the line are densely populated and carry many overhead telegraph and telephone wires. Steel towers of a simple but pleasing design have been erected every 160 m., which carry the double three-phase lines at a minimum height of 18 m. above the pavement. Twin-chains of 6 cap-and-pin insulators each were used throughout, with a double arcing horn between them. One of these units is shown in the accompanying illustration. Tests were made to investigate the danger to boys flying kites when the string touches the 100,000-volt line. It was found that a string, even when wet from rain water, does not carry sufficient current to be of any danger. If the wet string falls across two wires, it burns off instantly. — *Elektrotechnische Zeitschrift (Festschrift)*, May 28, 1922.



TWIN CHAIN INSULATORS USED ON 100,000-VOLT LINE

*The Application of Electric Power in the Iron and Steel Industry.* — W. S. HALL.—The subject is treated under the following headings: Sources of waste fuel for power generation; problems of plant transmission; frequencies to be used; distribution systems; demand for electric power and a few general considerations.—*Journal of the Western Society of Engineers*, May, 1922.

## Units, Measurements and Instruments

*Mechanical Testing Machines for a Porcelain Factory.*—W. DEMUTH.—The author gives an elaborate description of the machines for testing insulators in the new mechanical laboratory of the Hermsdorf (Germany) porcelain works. Of these the following are of special interest: A 500-ton compression press, a 30-ton tension press, a machine for testing pin-type insulators under a side pull, an optical apparatus to measure the expansion coefficient of porcelain, and a temperature-change arrangement whereby an insulator is dipped into cold and hot water in quick succession.—*Elektrotechnische Zeitschrift*, May 4, 1922.

*Vibrograph for Turbo-Generators.*—J. GEIGER.—For detecting irregularities of operation in high speed machines, a specially built vibrograph is described, which gave good results in locating troubles in steam turbo-generators. The apparatus measures 200 mm. each way and is small enough to be used in inaccessible places, like middle bearings, etc. A large number of oscillation curves, obtained with this apparatus are reproduced, which illustrate its sensitiveness. The author suggests that a more general use of such vibrographs would enable the operator to detect and to locate running troubles of turbines, gas engines, etc., in a very simple and positive way.—*Zeitschrift des Vereines Deutscher Ingenieure*, May 6, 1922.

## Illumination

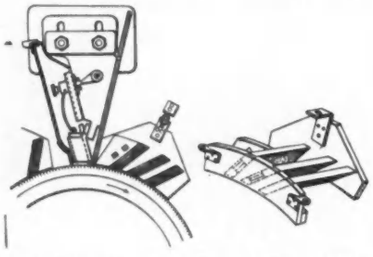
*Illumination Fundamentals for the User of Light.*—J. R. COLVILLE.—The importance of good lighting is not generally recognized and its industrial importance is only beginning to be understood. The author describes in some detail the fundamentals which must be considered in producing good lighting. These are (1) amount of light, (2) diffusion, (3) color quality, (4) shadow, (5) uniformity, and (6) maintenance. The article is concluded with an analysis of good and bad lighting. In analyzing bad lighting he gives the cause, the effect and the remedy—*General Electric Review*, June, 1922.

*Ideal Requirements and Practical Solutions of Industrial Lighting.*—L. GASTER.—There are four main conditions

to be satisfied for ideal lighting, namely: (a) Sufficient illumination; (b) constancy and uniformity of illumination over the working area; (c) the placing and shading of lights so that no inconvenience is experienced from glare; (d) the placing of lights so as to avoid any inconvenient extraneous shadows on the work. There was a general recognition expressed in the discussion of this paper that these requirements could readily be complied with by using modern illuminants and illuminating apparatus and that their application would remove the worst cases of unsatisfactory lighting and raise the general standard of illumination in factories considerably.—*The Illuminating Engineer*, Vol. 15, No. 3.

## Motors and Control

*Voltage Limitations and Flashing of Synchronous Converters.*—J. L. BURNHAM.—The author discusses the technical details of the causes and shows the remedy for serious flashovers on



FLASH BARRIER WITH BRUSH RIGGING FOR PREVENTING FLASHOVERS

synchronous converters. He describes and illustrates the flashover barriers which have been put into service and which have proved most successful.—*General Electric Review*, June, 1922.

*Cutting Operating Costs in Silk Mills by Correct Motor Applications.* — All the motors used in the silk industry are in general of comparatively small size. The squirrel-cage induction motor appears to be a favorite since its inherent characteristics fit in with the work to be done, and also enable it to perform its functions with a minimum of attention and usually with practically no maintenance expense. About thirty applications of motors in particular cases are shown in the illustrations.—*Electrical Record*, May, 1922.

## Heat Applications and Material Handling

*Electric Heating of Residences.* — E. A. LOEW.—A bulletin reviewing the experiments and reports on electric house-heating installations, the most extensive, other than those in Tacoma, Wash., being found in the community established on the Minidoka Project of the United States Reclamation Service in Idaho. The author gives an extensive description of domestic heating in Tacoma, where for a number of years a power rate has been in effect for encouraging consumers to use electrical energy for this purpose. In view of the excellent showing, it seems apparent that Tacoma's experiment in electric house heating has been quite successful. — *Bulletin No.* 15 *of the University of Washington.*

*Electric Furnace Iron and Steel Intermittent and Alternating Operations.* —W. E. CAHILL.—It is shown that in Treadwell, Alaska, cast iron is made more cheaply in the electric furnace than in the cupola. Analyses figures show that from charges of all-scrap cupola-melted iron the electric furnace produces metal of greatly reduced sulphur content. Factors affecting the economy of melting and the advantages of the electric furnace in foundry practice are discussed. The effects of intermittent operation on the furnace and the precautions necessary in alternating heats of iron and steel are discussed.—*Paper presented before the American Electrochemical Society, Baltimore, Md.*, April 27, 1922.

## Electrophysics, Electrochemistry and Batteries

*Prevention of Electrolysis Troubles in Underground Water Pipe.*—E. B. STEWART.—After discussing the effects of electric currents on cast iron pipes and giving descriptions of pipe drainage systems, the author enumerates several methods for preventing electrolysis. Among those commonly used are: (1) Surface insulation of pipes; (2) insulating joints and (3) pipe drainage systems.—*The Canadian Engineer*, May 16, 1922.

## Traction

*Electric Freight Locomotives for Chile.* — A description is given of the freight and switching locomotives that are to be used on the electrified section of the Chilean Railways. The operating potential is 3,000 volts. The

CHILEAN STATE RAILWAYS LOCOMOTIVES FOR ELECTRIFIED SECTION

| | Road Freight Locomotive | Switching Locomotive |
|---|---|---|
| Track gage | 5 ft., 6 in. | 5 ft., 6 in. |
| Length over buffers | 49 ft., 10 in. | 40 ft., 0 in. |
| Length over cab | 38 ft., 0 in. | 17 ft., 0 in. |
| Total wheelbase | 37 ft., 0 in. | 27 ft., 4 in. |
| Rigid wheelbase | 13 ft., 9 in. | 8 ft., 6 in. |
| Height, top of rail to cab roof | 12 ft., 7 in. | 12 ft., 3 in. |
| Width over cab sheets | 10 ft., 0 in. | 10 ft., 0 in. |
| Height of coupler | 41 in. | 36 7/8 in. |
| Wheel diameter | 42 in. | 42 in. |
| Weight of complete locomotive | 226,000 lb. | 136,000 lb. |
| Weight of mechanical parts | 140,000 lb. | 86,000 lb. |
| Weight of electrical equipment | 86,000 lb. | 50,000 lb. |
| Weight per driving axle | 37,670 lb. | 34,000 lb. |

freight locomotive is rated at 1,680 hp. and the switching locomotive at 560 hp. The dimension and weights of each type are given in the accompanying table.—*Railway Electrical Engineer*, May, 1922.

*France Making Real Progress in Electrification.*—P. CARPENTIER and E. M. BILL.—The Paris-Orleans Railway, a pioneer in electrification, plans to electrify at once a complete steam-engine division with direct current at 1,500 volts. Other French railroads are planning to follow suit. The total mileage that is involved in the twenty-year program outlined is 5,000.—*Electric Railway Journal*, June 10, 1922.

## Telegraphy, Telephony, Radio and Signals

*The Recording and Printing of High-Speed Radio Signals.*—G. W. O. HOWE. —The several types of recorders that are now in use are reviewed with the statement that the future economic success of long-distance radio-telegraphy depends to a large extent upon the development of reliable high-speed transmitting and receiving apparatus. —*The Electrician*, May 12, 1922.

*Methods of Radio Direction Finding as an Aid to Navigation.*—F. W. DUNMORE.—Since the great value of the radio direction finder as an aid to navigation is being recognized, considerable importance attaches to the question whether its proper location is on shipboard in the hands of the navigator or on shore. The author summarizes the relative advantages and disadvantages of its location on shore and on shipboard and comes to the conclusion that the place for the direction finder, like the magnetic compass and other navigating instruments, is on shipboard in the hands of the navigating officer.—*Letter Circular No.* 56 *of the Bureau of Standards.*

*Mobile Radio Telephone for the Parisian Police.*—For a better policing of the city of Paris, regular radio telephone communication is now maintained between one police airplane, two police automobile ambulances and headquarters, all four being equipped for sending as well as receiving. Standard French military sets are used, supplied with current from a propeller driven generator on the airplane, and from storage battery driven motor generators in the ambulances. Two 4-m. long steel tubes, attached at the end to a bakelite stick, form a mast to support a 40 m., single wire antenna, the other end of which is fastened to a short bamboo pole, driven in the ground. If no gas or water outlets are available for a ground connection, a copper wire mesh 10 m. by 0.8 m. is stretched out on the ground. Only ten minutes are required from the instant of arrival to make the necessary set-up. Perfect telephonic conversation can be maintained among these stations within a radius of about 30 km.—*Radioelectricité*, May, 1922.

## Miscellaneous

*Equipment and Inspection Records.* —A system for keeping account of equipment and maintenance work is outlined that will avoid delays and expense when changes or repairs are made. Besides enabling the department head to be prepared for changes and repairs, it also helps the maintenance force to carry on its work at the lowest possible cost.—*Electrical Review and Industrial Engineer*, May, 1922.

# Scientific and Industrial Research

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available and Suggestions for Co-operative Work

*Conducted by* PROF. VLADIMIR KARAPETOFF, *Cornell University, Ithaca, N.Y.*

[PRINTED IN THE THIRD ISSUE OF EACH MONTH]

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

## Research Completed

### Alternators, High Speed, Windage and Load Losses In.

It is possible to measure the load losses in totally inclosed generators more accurately than with any other type. From numerous determinations of rise of air temperature extending back several years, it is apparent that in the largest steam-turbine-driven generators that have been built, the windage losses are approximately 40 per cent of the total losses, and the load losses approximately 25 per cent.—*W. J. Foster, Schenectady, N. Y.*

### Current Transformer, Radio Frequency.

We have recently produced a radio-frequency current transformer having a current ratio of 200/1, and suitable for actuating a 1-amp. thermocouple type ammeter, thus functioning as a 200-amp. radio-frequency ammeter. This combination should be useful in research work on high frequencies in general, and in metering in connection with high-frequency electric furnace developments. The transformer is of the ring type, and is furnished without any primary winding. One turn of the primary produces a ratio of 200, two turns of the primary a ratio of 100, etc., giving a number of ranges with the same apparatus. Any 1-amp. thermocouple or hot-wire ammeter can be used with this transformer, and the errors in transformation are within tolerable limits for wide variations in frequency.—*Paul MacGahan, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

### Flow Meter.

A novel scheme has been developed of recording electrically the rate of water passing over a weir and also integrating the total amount. The method depends upon the depth of immersion of electrodes placed in the water above the weir. The higher the water level the deeper the immersion, and the less the electrical resistance. A second similar set of electrodes with constant depth of immersion, excited by the same direct-current voltage, forms part of the "control" circuit. The recording instrument is an ohm-meter connected to the two electrode systems. The apparatus can be placed at a very considerable distance from the weir, as the currents are very small.—*H. Tinsley & Company, London, England.*

### Furnace, Electric, High Pressure, High Temperature.

A high-pressure melting furnace of small capacity has been constructed and iron successfully melted under an external gas atmosphere of 3,000 lb. per square inch. The furnace casing is a chrome-nickel steel forging 7 in. diameter x 15 in.; the heating element is a graphite helix hung from the steel cover by heavy copper tubes, which serve as electrodes and for the circulation of cooling water. The entire furnace is cooled by immersion in a flowing stream of water. The heating space is 1¼ in. diameter x 4 in.; a magnesia crucible holds 100 grams of metal. The rate of power consumption increases with the pressure of the gas atmosphere, and at 3,000 lb. per square inch the charge of iron can be brought to fusion with an expenditure of 12 kw. at 50 volts in thirty minutes.—*N. B. Pilling, East Pittsburgh, Pa*

### Wattmeter, Polyphase, Thermoelectric.

A wattmeter (Fawssett indicator) has been developed for automatically indicating the power in a three-phase circuit at a distance of several miles. The actual operating circuit is a thermoelectric one making use of a unipivot direct-current galvanometer which may be scaled in thousands of kilowatts. Pilot wires laid with the transmission cables may be made use of to carry current.—*Cambridge Scientific Instrument Company, England.*

### Welded Joints, Electric and Magnetic Tests Of.

The electric or magnetic potential drop across the weld was measured with a definite emf. or magnetic potential applied on opposite sides of the weld. This drop was compared with the drop over an equal length of unwelded plate. After completing the electrical and magnetic tests the plates were cut into strips 1 in. wide at right angles to the welds and these strips tested for tensile strength. The electrical, magnetic, and tension tests showed a very fair general agreement among themselves and with the known quality of the welds are reported by the welder. A paper on the subject was presented before the American Society for Testing Materials, June, 1922.—*T. Spooner and I. F. Kinnard, Pittsburgh.*

### X-Ray, Rectification Devices For.

A synchronously revolving spark gap has been perfected for the rectification of high-tension alternating currents. The stationary part consists of metal spheres, the revolving part of two toroidal segments with rounded ends. The advantages of such a gap over the usual point gaps are: (a) Its properties are more nearly those of a stationary sphere gap; (b) the form of the rectified wave is more nearly constant and accurately adjustable; (c) it is substantially without corona and operates with a minimum of arcing, ozone and nitrous acid.—*Montford Morrison, Chicago.*

## Research in Progress

### Corona Loss.

We are working on the determination of corona losses in large conductors. This matter is of great practical importance, and preliminary tests have shown surprisingly large losses for certain large cables.—*J. C. Clark, Department of Electrical Engineering, Stanford University, Cal.*

### Cable, Hochstadter Type, Tests On.

Considerable interest has been manifested in the last few years in the developments of the Hochstadter type cable, which consists in a wrapping of thin metal strips around the conductor insulation and omitting the outer belt insulation. An extended investigation was made by the Electrical Testing Laboratories of New York. Apparently the increased current carrying capacity of this type of cable is about offset by the increased cost and the advantage, if any, will be due to the elimination of the tangential stresses in the central portion of the cable and the elimination of cable faults due to this cause. Tests to determine this point are now being conducted by a number of the member companies.—*Underground Systems Committee of the N. E. L. A.*

### Induction Motors, M.M.F. Harmonics in Space.

An investigation is being made of single-phase and two-phase characteristics and of the variations caused by changes in the ratios of the turns in the various stator coils. The investigation has for its object a more thorough knowledge of the ways in which harmonics produced in space by the winding distribution affect the motor torque.—*Massachusetts Institute of Technology, Cambridge, Mass.*

### No-Voltage Release with Time Delay.

Pacific Coast members brought out the desirability of a time delay for no-voltage releases which would prevent the current being cut off of a motor during an interruption, or period of low pressure, of a few cycles duration. Two devices of this kind have been developed and are now undergoing tests.—*Electrical Apparatus Committee of the N. E. L. A.*

### Oils, Insulating, Durability Tests For.

Suitable methods of durability tests of transformer oils are being studied by a committee representing transformer manufacturers, consumers, and oil producers. Sludging tests and accelerated oxidation tests in use in this country and abroad are receiving careful attention.—*T. G. Delbridge, Atlantic Refining Company, Philadelphia.*

## Suggestions for Research

### Alloys, Melting Points and Impurities.

The relation of melting points of alloys to composition, and the influence of natural impurities, are known fairly well for certain combinations, but there are many exceptions which cannot be accounted for by the use of any known law.—*C. E. Skinner, East Pittsburgh, Pa.*

### Corona Loss.

There is need for a determination and tabulation of Peek's "irregularity factor," Mo, for a wide variety of large cables. This is needed in order that his corona loss formulas may find a wider field of usefulness.—*J. C. Clark, Stanford University, Cal.*

### Conductivity, Relation of Electrical to Thermal.

It is not certain at the present time that there is a definite relation between these two characteristics of materials, either conducting or insulating. If a general law could be established, it would be of considerable value in connection with design work.—*C. E. Skinner, East Pittsburgh, Pa.*

[This suggestion has come up more than once, because of its importance in design work. According to the electron theory, there must be a definite relationship between the two conductivities.—ED.]

### Cables, Dielectric Stresses In.

Until the proper method of calculating the limiting stresses of high-voltage cables and the limiting values for these stresses is determined, it will not be possible to design cables with the thickness of insulation properly proportioned to the working voltage.—*D. W. Roper, in the A. I. E. E. Journal, June,* 1922.

### Furnace, Electric, for Making Insulators.

On account of its better temperature distribution and control, an electric furnace would be preferable to the present fuel furnace, for firing insulators. Such a furnace would have to stand the required high temperature, up to 2,500 deg. C. The electrical industry urges electric heating on other industries; here is an opportunity of using it at home.

### Oil, Centrifugal Separator For.

Some operating companies are using centrifugal separators in place of the filter press for cleaning and drying their insulating oil. A systematic study of advantages and disadvantages of both methods is desired.—*Electrical Apparatus Committee of the N. E. L. A.*

### Meter, Volt-Ampere-Hour.

One method for measuring the total volt-ampere-hours is to measure the true watt-hours ($IEH\cos\phi$) with an ordinary watt-hour meter, and the $IEH\sin\phi$ with a similar meter in which the potential phase has been shifted by 90 electrical degrees. An automatic addition of these two quantities from instant to instant may be possible by using a hard rough sphere to the surface of which two disks are applied, each actuated by one of the two above-mentioned meters. The disks must be applied in a diametral plane at 90 deg. from each other. The motions of rotation which these disks seek to communicate to the sphere are proportional to $\cos\phi$ and $\sin\phi$ respectively, so that the actual velocity of rotation of the sphere is proportional to $IEH$. The arrangement is similar to that used in harmonic analyzer (see, for example, *Journal of Franklin Institute,* September, 1916.)—*F. R. Innes, Detroit, Mich.*

### Insulation, Effect of Transient Voltages on.

The solution of this problem is of increasing importance with high-voltage transmission.—*C. E. Skinner, East Pittsburgh, Pa.*

# News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

## To Celebrate Founding of Edison System

The fortieth anniversary of the starting of Edison service will be celebrated in New York City on Sept. 11. As a matter of history the old Pearl Street station in New York began operations at 3 o'clock on the afternoon of Sept. 4, but inasmuch as that date is a holiday (Labor Day), when most people are apt to be out of the city, it was decided to celebrate the fortieth anniversary of the starting of the Pearl Street station a week later. The New York Edison will be the host and suitable addresses by Edison pioneers will be made. It is expected also that Edison himself will be in attendance. A feature of the celebration will be an historical exhibit of Edison apparatus, models, lamps, photograph, etc., which are now being collected and arranged.

## Coal Production Decreasing

The effect of the railroad strike and of the holiday period has been to decrease the weekly production of coal about a million tons. No general demand for coal exists as yet, showing there are still stocks in the hands of consumers.

The anthracite situation seems to be clearing up with the acceptance of the offer of President Harding with a reservation, but the bituminous deadlock still continues.

## German Die Patents Data Returned

Francis P. Garvan, president of the Chemical Foundation and former Alien Property Custodian, turned over to the special Federal Grand Jury in Washington books and records relating to the German patents acquired by the foundation. In regard to the report that the patent investigation resulted from German influence, Attorney-General Daugherty made a flat denial.

On Monday the government served formal demand on the Chemical Foundation for return of the former German patents and other property sold to it by former Alien Property Custodian F. P. Garvan. Announcement was made by Alien Property Custodian Miller that the papers had been served on Mr. Garvan as president of the foundation in New York by Frederick H. Wilson, acting for the property custodian. Service was also made in Wilmington, Del., on the Corporation Trust Company, representative of the foundation. The foundation was subpœnaed to appear in Washington on July 11 with books and records before the grand jury. It is reported the government is preparing a criminal suit against the foundation for trial in the District of Columbia.

## International Engineering Congress in Brazil

Through and by the courtesy of Brazil, on the occasion of her Centenary of Independence, it will be possible for engineers of all countries to meet in conference. The meeting will occur Sept. 7-30 at Rio de Janeiro in connection with the opening of the Brazilian International Exposition.

The Club de Engenharia of Rio de Janeiro is officially charged with organizing the congress. It is understood that representatives of all American countries will attend. The subjects for discussion will be power development from coal and water, irrigation methods, elimination of waste, railroads, port developments, steel industry and engineering co-operation.

## Government to Offer Radio Telephone Service

Plans are being considered by the Post Office Department for changing at least a few of the fifteen radio stations operated in connection with the Air Mail Service to provide both radio telegraph and radio telephone service. The stations are at Washington, D. C.; Habelhurst, L. I.; Bellefonte, Pa.; Cleveland, Ohio; Bryan, Ohio; Chicago; Iowa City, Ia.; Omaha, Neb.; North Clerk, Neb.; Cheyenne, Wyo.; Rock Springs, Wyo.; Salt Lake City, Utah; Reno, Nev.; San Francisco, Cal.

The Washington station has had both radio telegraph and radio telephone service for nine months. Besides maintaining an hour to hour record of the progress of air mail the Post Office Department radio stations now send out other information. Complete weather reports now go out daily. Also reports of grain, dairy, and livestock prices travel the ether waves to the farms and farming communities.

It is still uncertain just when the stations will be changed to radio telephone apparatus. Because of the first call on the radio by the air mail, the equipping will probably be gradual. Further announcements concerning the new service are expected soon.

## Another Bill on Muscle Shoals

Acceptance of the offer of Henry Ford to lease the Muscle Shoals, Ala., nitrate project is proposed in a bill introduced by Senator Ladd of North Dakota, a member of the Senate agricultural committee, which has been considering the lease offers. The bill is similar to the measure presented in the House by Representative Wright of Georgia. In presenting the bill Senator Ladd read letters approving the Ford proposal from a number of farm organizations. The Senator says a number of the members of the Senate agricultural committee favor the Ford proposal.

## New 150,000 Kva. Plant for Connecticut

A large steam station is to be constructed for the Connecticut Light & Power Company at Devon, Conn., near the mouth of the Housatonic River. This site is at tidewater and the new plant will tie in with the company's existing steam and hydro plants.

It is now planned that this plant will have an ultimate capacity of 150,000 kva. It will be so designed, however, to permit expansion beyond this size. The site selected for the plant consists of about 50 acres of land fronting on the Housatonic River and lying between the river and the Naugatuck division of the New York, New Haven & Hartford Railroad immediately north of the main line bridge over the Housatonic River. This site will enable the company to obtain both rail and tidewater delivered coal. The initial installation will probably be two 25,000-kva. units, although it is possible that larger units may be installed.

Transmission lines operating at 66,000 volts will run from this plant to connect with existing lines at the company's new Stevenson hydro-electric plant and another line will run from the new plant to supply the company's distribution system in the vicinity of Norwalk.

"This plant in all respects will be one of the so-called superpower stations so that it will fit in with the superpower plan for New England," stated Irvin W. Day, vice-president of the company.

The construction work will be done by the U. G. I. Contracting Company of Philadelphia and it is expected that the plant will be ready for operation in the fall of 1923.

## Japan Buys Thirty-four Electric Locomotives in England

The Imperial Government Railways of Japan has just placed with the English Electric Company an order for thirty-four complete electric locomotives of a total value of more than $2,000,000.

Eight of the locomotives are for heavy express passenger service. They are of the 2-C-C-2 type, weigh about 96 tons and are designed to haul a 415-ton train at 60 m.p.h. Each locomotive has six motors rated at 306 hp., 500 volts. The motors are connected in two groups of three in series on a 1,500-volt trolley.

Of the remaining locomotives, nine are for local passenger service and seventeen for heavy freight service. These twenty-six are of the B-B type and weigh about 56 tons each. They each have four motors similar to those on the express passenger locomotives. The local passenger locomotives are designed to haul a 315-ton train at 55 m.p.h. The freight locomotives haul a 500-ton train at 40 m.p.h.

## A 600-Kv. Experimental Transmission Line

An experimental transmission line for operation at 600 kv., the highest voltage line in the world, has recently been completed at Purdue University, Lafayette, Ind. This line is approximately one-third of a mile in length and consists of three 600-ft. strands of steel core aluminum cable supported on steel towers 65 ft. high. Fifteen-unit suspension insulators are hung from carriages upon 40-ft. channel-iron crossarms in such a manner as to be readily moved in a transverse direction while under strain of the cable. Tests may therefore be readily made with different spacings between cables. Two cables, sizes varying from No. 1 B. & S. to 500,000 circ.mil, are used for a single-phase circuit upon which may be impressed voltages up to 600 kv. at 60 cycles.

Two 300-kv., 135-kva. Westinghouse transformers, each with one terminal connected through a condenser bushing, and one terminal grounded, may have their secondary coils connected in series in order to provide 600 kv. between line cables. Voltage is measured upon tertiary coils provided in the transformers which are calibrated with the A.I.E.E. standard sphere-gap. A crest voltmeter is also available for maximum voltage readings. The actual power being supplied to the line may therefore be measured in the high voltage circuit without introducing transformer losses. A short feeder, consisting of two 500,000 circ.mil cables widely spaced, reduces the tare losses to a minimum. These may be accurately measured and subtracted from the gross readings. The voltage is controlled by means of an auxiliary transformer and double-drum motor-driven controller which provide 480 equal steps, or voltage increments without distortion of wave form.

The steel towers are an adapted standard semi-flexible construction of the Bates Expanded Steel Truss Company with spcial channel-iron crossarm and crossarm truss. Intermediate towers are self-supporting, but end towers are provided with bridle guys of ⅝-in. steel extending to four points upon the crossarm. Four standard types of suspension insulators were provided by the Locke, Ohio Brass, Thomas and Jeffery-Dewitt Companies, while the cables were supplied by the Aluminum Company of America.

As little is known about the phenomena of corona losses above 220 kv., and as it is probable that voltages far in excess of that value will be used for power transmission in the future, as the results of the further development of coal mines and hydro-electric power plants at great distances from available markets, it is believed that this line at Purdue University may prove of great value in these pioneer investigations.

# Public Relations and Transmission Discussed at Ohio Convention

### With the People Dependent on Service They Are Interested in the Welfare of Utilities—Highway Lighting Suggested as a New Field of Development

AN ADDRESS which emphasized the need for public utility companies gaining and keeping the good will of their patrons, who comprise practically every family in the state, was prepared by W. A. Wolls, president of the Ohio Electric Light Association, to open the twenty-eighth annual convention of that organization at Cedar Point on July 11. Owing to the unavoidable absence of Mr. Wolls, the address was read by E. L. Franklin, vice-president.

With practically all the people of the country dependent more or less on the service of utilities Mr. Wolls stated that this factor alone would create an interest in welfare in these utilities. Considering the problems of the new-business departments, he thought that the highway lighting field might be one worthy of investigation.

In presenting his report as chairman of the transmission and distribution committee, A. M. Wilson, Cincinnati, Ohio, voiced the need of extensive studies on the subject of grounding secondaries. With very little information on the ground resistances in various sections of Ohio for different seasons Prof. Wilson considered this a real problem worthy of experimentation. He also reported progress on the preparation of the Ohio map showing the power lines of 10 kv. or over.

While discussing lightning arrester developments G. N. Lemmon of Marietta, Ga., asserted that the discharge rate should be studied since it is one of the most vital factors in the problem of transmission because of the shock and sudden readjustment of the electrostatic and magnetic energy. The ideal arrester would be one limiting this shock to a small value. He also declared that weather conditions affected the disk gaps since rain caused a discharge at a lower voltage

Operation of the Ohio State Public Utilities Commission's rules governing the construction of overhead wires in the state was discussed Wednesday by Ward H. Snook, inspector of power wires for the commission, addressing the convention.

"These Ohio rules, drafted by engineers for Ohio utility companies, with the co-operation of the commission's engineers, are perhaps the best thing of their kind in existence," said Mr. Snook. "They are but the milestone on the highway of progress which marks the official adoption by the utlity companies of Ohio of the soundest of all economic principles, namely, 'Do unto others as you would that they do unto you'; in other words—co-operation.

"The use of a highway by a public utility is a public use. Its right on the highway is a public right and not a private right. The public utility using the highway must, therefore, so use it that it will not unnecessarily interfere with the public's use of its own, either for travel or for further use of the highways as an artery of commerce, communication or supply.

"Should some future Bell, Edison, or Marconi still further complicate matters by inventing something of similar utility, there will have to be found a place for it on the highways. The complexity of this problem has led Ohio to adopt rules, regulations and specifications based on the natural and economic laws involved."

## New $3,000,000 Coal Pier at Norfolk

The Virginian Railway is preparing to spend $3,000,000 for the erection of an electrically operated coal pier at Sewalls Point. Bids are expected to be asked for within a short time. This pier is in line with plans greatly to augment the facilities for handling coal. New lines are to be built into the coal fields which are served by the Virginian. Hampton Roads as a coal port is rapidly coming to be of great importance. To the two piers of the Virginian, there are added the three piers of the Norfolk & Western and two of the Chesapeake & Ohio.

## Municipal Radio Stations Attracting Attention

Considerable talk is being indulged in by municipalities in various parts of the country looking toward the establishment of radio transmitting stations. A number of cities are already using the radiophone for police purposes in a limited way and some use is also being made for broadcasting purposes. Chicago has had a well-equipped station in operation since last fall experimenting with the police and fire department uses and is believed to be the first city to maintain a regular broadcasting schedule. Such a schedule has been maintained for several months and consists of talks on matters of public interest from authorities on the subjects selected as well as musical and other entertainment features. New York has announced that it will erect its own station. Dallas has been using radio in its police department, and in a number of cases broadcasting stations owned by private parties are cooperating with police authorities in the broadcasting of police and other news.

## John Fritz Medal Awarded to Marconi

The John Fritz Medal, the highest award in the bestowal of American engineers on July 7, was presented to Senator Guglielmo Marconi before a distinguished audience in the Engineering Societies' Building, 29 West Thirty-ninth street, New York.

Bestowed annually for "scientific and industrial achievement," Marconi was awarded the gold medal of 1923 for the invention of wireless telegraphy. Dr. Elihu Thomson, medalist of 1916 for his achievement in electrical engineering and scientific research, made the presentation, hailing Marconi as the great pioneer in wireless, the individual directly responsible for safety on the high seas and the other "beneficent results" that followed his invention.

In acknowledging the honor conferred upon him, Marconi described himself as being nervous about continuing "to make good" in face of the high hopes and expectations of his friends in this country.

"I have long realized that in America, more than anywhere else, the most cordial and generous encouragement is given to any honest endeavor to apply science to useful and practical purposes," he said. "I consider myself fortunate that much of my early work in radio has been carried out in this country, for I cannot help feeling that you realize that wireless communication has become useful and often necessary, on sea and on land, besides tending to increase and simplify the facilities for closer communication between distant peoples on this earth, thus contributing, I hope, to make good will take the place of the unrest and mutual suspicion which unfortunately seems at present to be a dominating feeling among many nations."

Professor Comfort A. Adams of Harvard University, chairman of the John Fritz Medal Board of Award, described Marconi as the nineteenth Fritz medalist, his predecessors having all been engineers of surpassing achievement on both sides of the Atlantic. The award was established in 1902 about the time of John Fritz's eightieth birthday. The medal fund was contributed by friends of Mr. Fritz, and its administration was assigned to the four national engineering societies: The American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

Senator Marconi sailed for Italy on his yacht *Electra* on July 8.

## Hydraulic Survey of Green River

For the purpose of determining power and reservoir site possibilities, a complete topographic survey of the Green River from Green River, Wyo., to Green River, Utah, is being undertaken. The work will take between three and four months. It is the first attempt to complete an actual survey.

The 300-mile river trip and a 70-mile side trip down the Yampa River will be made in three specially constructed boats. Nine feasible dam sites, capable of an approximate production of 1,500,000 hp., will be investigated.

The personnel of the party includes Ralf R. Woolley, hydraulic engineer of the United States Geological Survey; K. W. Trimble, chief topographer; two experienced boatmen who will act as rodmen, an expert boatman, a geologist, a cook, and H. L. Stoner, representing the Utah Power & Light Company.

## Commonwealth Edison Makes Record

The Commonwealth Edison Company became the greatest producer of electricity in the world in 1921 with an output of 1,928,271,940 kw.-hr. It had 536,982 customers and it is estimater that the company produces 70 per cent of the electricity and 45 per cent of all steam and electric power used in Chicago.

The books of the company show an investment of $3.18 in producing property for each dollar of revenue from operation. The total investment of $118,275,716, as of December, 1921, is divided as follows: $43,700,000 in generating stations, $10,000,000 in overhead lines, transformers and services, $10,000,000 in tunnels and conduits, $20,000,000 in underground cables, over $6,000,000 in meters and the remainder in real estate, etc.

The company has the record of never having increased its rates for electricity and has scaled them down whenever possible.

## Decision on Non-Par Value Stock Tax

The Appellate Division of the New York State Supreme Court, Third Department, handed down a decision Monday on the state taxation of so-called "non-par value" stock. Action was brought by the Terminal & Town Taxi Company, which was assessed for license and franchise taxes as though each share of "non-par value" stock were worth $100. The taxi company set forth that this assumption, based on the provisions of the law in 1920, mitted to the commission for further the actual value of each share was $8.55. In view of the fact that many public utility companies have large issues of non-par value stock the findings of the court are not without interest.

The decision of the Appellate Division, which was written by Justice Kellog, said:

"There is no authority for the assumption that non-par value stock has a value of $100 a share for the purpose of assessing the tax under Section 181. We think that the tax to which the relator is liable under that section must have as its base the actual capital of relator employed within this State."

"The determination of the State Tax Commission should be annulled," the decision concludes, "and the case remitted to the Commission for further action in accordance with this opinion."

## Status of Appeal on Depreciation Regulation

In a letter to the Secretary of War, L. W. Wallace, the executive secretary of the Federated American Engineering Societies, asks what has happened to the appeal of the electrical industries against the depreciation regulation drafted for use in connection with the waterpower act. Mr. Wallace's letter reads as follows:

"For many months there has been pending before your commission an appeal from the electrical industries against the depreciation regulation which it was proposed to enforce in the administration of the waterpower act.

"Many of the engineers who compose this organization are particularly anxious to see our waterpower resources utilized as extensively and as promptly as is possible, and some of them have requested that I secure an authoritative statement as to the status of the matter. There is a feeling that the uncertainty in regard to depreciation is tending to retard this development.

"May I inquire what are the prospects for action on the depreciation regulation? It should be very helpful to our members if we could have the advantage of any personal views on the subject which you may care to express."

## Plumbs Ocean Depths

An invention of great importance has been contributed to the science of the sea through the discovery and development by the navy of a radio sounding device for registering ocean depths. The new device was tried out on a cruise of the destroyer *Stewart* from Newport and Gibraltar and proved a complete success, registering automatically and instantaneously depths ranging from 2,400 to 28,000 ft.

Dr. Harvey C. Hayes, physicist of the Naval Engineering Station at Annapolis, is the designer of the apparatus and went on the *Stewart* to test it. He has cabled to the department that the experiment was a complete success and is now on his way home to give a detailed report.

The apparatus is simple in operation and measures the time it takes for a sound from a ship to reach the bed of the ocean and return. Sound from an oscillator, installed in the aft part of the ship, is projected against the ocean bed and rebounds, being received by sensitive ears in the forward part of the ship. The elapsed time is automatically measured.

The sound transmitter develops a high frequency vibration in a diaphragm, which is in contact with the water. The high note carries many miles, while the receiver also can detect signals from great distances.

## National Electrical Safety Code Approved by A. E. S. C.

The American Engineering Standards Committee, by letter ballot, has approved the National Electrical Safety Code of the Bureau of Standards, which covers the generation, distribution and utilization of electricity for power, light and communication.

In making public this decision, the Standards Committee announces that there is now in process of formation a thoroughly representative sectional committee to consider any revisions of Part 2 of this code, "Rules for the Installation and Maintenance of Overhead and Underground Electrical Supply and Signal Lines," which may be deemed necessary by any of the interested parties. There are also being organized three sub-committees to take up the unification of crossing specifications under the three following heads: Signal lines crossing railways, power lines crossing railways and power lines crossing signal lines.

These committees are being organized in conformity with the action of the recent conference, held on March 2, on the standardization of crossing specifications, at which there were present the representatives of fourteen national, engineering, utility and industrial associations, four departments of the federal government, various state commissions of Connecticut, Iowa, Minnesota, New York, and of the telephone, telegraph and cable companies.

It is believed that this action, together with the organization of the representative committees to take care of the revision of the code and to prepare the crossing specifications, constitutes one of the most important steps yet taken in securing national uniformity in these matters.

## Commercial Problems to Feature Illuminating Convention

Application problems and commercial questions will largely occupy the program of the Sept. 25-28 convention of the Illuminating Engineering Society at Boston, Mass., according to an announcement following a meeting last week at Boston of the general convention committee. Forty delegates were present, including two past-presidents from outside New England. Committees are now at work planning a business and entertainment schedule which will appeal to many different minds in the electrical industry. At the Boston meeting the following committee chairmen were appointed: Entertainment, C. A. B. Halvorson, Jr., Lynn, Mass.; publicity, M. R. Griffeth, Boston; attendance and local arrangements, A. W. Marcou, Boston; finance, R. S. Hale, Boston. President C. L. Edgar of the Edison Electric Illuminating Company of Boston is chairman of the general committee, H. F. Wallace of the General Electric Company, Boston, vice-chairman, and J. Daniels, Boston, secretary.

A. M. Powell, Harrison, N. J., vice-chairman of the meetings and paper committee, is in charge of the convention program.

## Illuminating Engineering Nomenclature Approved

The American Engineering Standards Committee announces that the illuminating engineering nomenclature and photometric standards of the Illuminating Engineering Society, 1918 edition, have been approved by the A. E. S. C. as "American standard," with the substitution of six internationally agreed upon definitions for certain ones of the 1918 rules. The definitions which have been reworded are: Luminous flux, luminous intensity, illumination, candle, lumen, and lux.

The special committee of the A. E. S. C. which examined the proposal submitted by the I. E. S. and which recommended approval of the nomenclature and photometric standards included representatives of the U. S. Bureau of Standards, the American Gas Association, the American Physical Society, the International Acetylene Association, the Optical Society of America, the American Institute of Electrical Engineers, the Illuminating Engineering Society and the National Electric Light Association.

## Short Circuit Causes Subway Accident

### Intense Heat and Fire Extinguisher Fumes Overcome 150 Passengers in Interborough Tube

An arc starting in a controller box on a subway train in New York on July 6 resulted in smoke and fumes from chemicals used as fire extinguishers which overcame 150 passengers.

The intense heat of the d.c. arc apparently broke down the carbon tetrachloride, which is one of the chief ingredients, into phosgene gas, carbon dioxide and carbon monoxide. Whatever the cause of the gas, the passengers in the train were overcome by fumes and smoke and had to be carried to the surface.

In reporting the accident the New York *Times* stated that Dr. W. F. Hellebrand, chief chemist of the Bureau of Standards, said that experiments had been made which showed that when pyrene is cast on a hot fire corrosive and irritating fumes are produced. Dr. Clarence L. West, a noted chemist, is reported as having said: "Pyrene when used in an inclosed space develops phosgene gas. The Bureau of Mines has been making experiments in its Pittsburgh laboratory and my understanding is that these experiments have disclosed this fact. I, of my own knowledge and experience, also know that phosgene gas is caused when pyrene is used in extinguishing fires."

The intense heat of an arc resulting from a d.c. short circuit on the subway system apparently involves so much energy that the constitutents of the extinguisher are broken down. However, for small fires, the action is entirely different and satisfactory results are obtained.

The one great advantage of the carbon tetrachloride extinguishers is that they are non-conducting and thus increase the safety of the operator.

In the 1922 report of the Accident Prevention Committee of the N. E. L. A. the statement is made that "Care must be exercised when carbon tetrachloride is discharged in a confined space with little or no ventilation, as the chloride gas given off may cause unconsciousness."

## To Hold Conference of Co-operative League

In order to create an opportunity for the exchange of ideas and experiences which may assist more effectively in carrying forward local activities, a conference is to be held in September or October. A canvas is now being made by the Society for Electrical Development to ascertain the date most favored.

The call for the conference is made to local co-operative leagues throughout the country and the belief exists that such a meeting will produce valuable results, for the objects of all such organizations are the same.

## New Film for N. E. L. A.

"Back of the Button," the popular film on electricity put out last year by the N. E. L. A., has been surpassed in popularity by the new film entitled "Yours to Command," described in the *Electrical World* of May 20.

The picture depicts the use of electricity in every-day activities and plays up special processes using electricity. The picture ends by showing that revenues are vital to secure the growth of the utilities. Reports indicate that the new film is very popular.

## India Interested in Water Power

Considerable interest is being shown in the Bombay district of India in the development of waterpower, the mountainous nature of this part of India, the need for irrigation and the heavy rainfall during the monsoon period all adding to the probability of early development of hydro-electric resources.

A ready market for electric power exists in the city of Bombay and vicinity, the growth of which market is being provided for by the new installation at Nila Nula, bids for which will probably be asked for in the summer of 1923. The increasing need for power in Bombay is due to the growth of mills there, the proposed plan to electrify the steam railroads within the city and projected new interurban trolley lines. The electrification of the steam railroads will be decided upon in the immediate future.

The next project in importance is that of the Pench River to supply power to the mills and lighting plants at Nagpur, a city of 101,000 population. Immediate action on this project is probable.

Preliminary surveys have been made at the direction of the Governor of Bombay for thirteen other projects in this presidency. The total power possibilities of these thirteen sites is estimated at 230,350 kw.

## Coal Mining Costs Vary

Any attempt by the government to fix coal prices or establish maximum limits for selling charges will require "adequate and current information" as to costs and investments in the industry and differences in the figures between districts, the Federal Trade Commission reported to Congress in a discussion of its investigation into bituminous production.

Although its inquiries have been suspended by reason of injunction proceedings brought against its activities in the industry by the bituminous coal operators, the commission explained that work carried out prior to suspension indicated a wide range of investment totals.

Coal is being mined in important districts, with a permanent capital investment as great as $9 per ton of annual output and as low as $1 per ton of annual output, the commission found. The average investment cost is $3.12 per ton.

Investment was placed at $4.26 per ton in southwest Pennsylvania, at $3.04 per ton in central Pennsylvania, at $1.94 in the Illinois No. 3 district, at $1.44 per ton in the Indiana No. 1 district and $8.32 per ton in Utah. All figures referred to bituminous production. This variation, the commission indicated, was very important in the matter of fixing fair prices or setting price standards for coal, since each ton of coal produced would be obliged to bear a corresponding ratio of overhead cost of production. The investment information would be useless in determining final production costs, the commission indicated, unless there was added to it and considered with it the current costs of operation, selling costs and other factors.

## Mexican Railroads Turning to Electric Power

Within the next twelve months the mountain division of the National Railways of Mexico between Monterey and Carneros will have been transformed from steam to electric power, according to G. L. Trevino, electrical engineer of the system, who is in charge of the construction work now in progress. This track forms part of the trunk line that runs between Laredo, Tex., and Mexico City.

The division which is being electrified is 96 miles long and the maximum grade is 2 per cent. It is asserted by Mr. Trevino that the electric power for operating the locomotives will be obtained from two stations, one in Monterey and the other in Saltillo. The engines will be of 300 tons and their hauling capacity will be 1,500 tons each. The fact that a very heavy freight traffic passes over the division between Monterey and Carneros, much of it coming from the mines in the region adjacent to Saltillo, makes the adoption of electric power of much importance. Mr. Trevino estimates that the saving in the use of electric power over steam power will amount to more than $500,000 in United States money a year.

As soon as the electrification of this 96-mile stretch of track is finished the still more important project of converting to electric power the Tampico-San Luis Potosi division of the system will be undertaken, according to Mr. Trevino. In connection with this latter improvement it is planned to install a large hydro-electric plant at Micos Falls, situated within sight of the road. This division is 276 miles long and the maximum grade is 3 per cent. The electrifying of other divisions of the system is in contemplation.

Reports persist that the electrification of the Mexican Railway, the English-owned line which connects Mexico City with Vera Cruz, is before long to be undertaken. It is said in Washington that definite arrangements for equipment were entered into some time ago by the railroad, but that the inauguration of the work is to be contingent upon its ability to put through certain additional financing. This in turn is dependent upon the political stiuation in Mexico. The plan, it is understood, is to electrify only that part of the road in the vicinity of Orizaba, where there is an abrupt ascent from the coastal plane to the central tableland. Waterpower is available in that region.

## Joint Committee and S.E.D. Agree on Working Plan

The Joint Committee for Business Development, sponsored by the N. E. L. A. and the Society for Electrical Development, has emulated a working plan for closer co-operation between the two organizations in carrying on the work of business development under the slogan "Electrify." According to the arrangement the S. E. D. will produce the literature, gather the statistics and do such other work as the joint committee may call on it for. In addition the S. E. D. will have general charge of the field work in connection with the formation of local electrical leagues. All work in connection with the business development movement will be under the general direction of the joint committee or of the executive committee of the Joint Committee for Business Development.

## Southern California Edison to Alter Stock Issues

John B. Miller, president of the Southern California Edison Company, issued a formal notice to 47,000 stockholders of the company announcing a plan of rearrangement of capitalization of the corporation.

"The company's general policy," said President Miller, "is to provide the major part of its new construction needs through the sale of bonds and the remainder by capital stock. Heretofore common stock paying 8 per cent dividends has been sold. It is now proposed to substitute a stock limited to 7 per cent dividends for future sales, thus resulting in the company securing funds at 1 per cent less than formerly, with the resultant benefit to present stockholders.

"The present capitalization of the company consists of first preferred stock, of which $4,000,000 was authorized and an equal amount outstanding. Of the second preferred, $12,500,000 was authorized with $12,029,900 outstanding. Of the common there was authorized $83,500,000, with $50,407,400 outstanding, making a total authorized capitalization of $100,000,000, of which $66,437,300 is outstanding."

It is now proposed to rearrange the capitalization so as to provide for the original preferred stock, of which $4,000,000 will be authorized, with the same amount outstanding; preferred stock $36,000,000, with $9,500,000 outstanding. Of the common, $60,000,000

will be authorized, with $50,407,400 outstanding, making the total capitalization $100,000,000, with $63,907,400 outstanding.

The original preferred stock will occupy the same position as the present preferred stock, says President Miller. All of the second preferred stock will be retired. This rearrangement will make available a new stock limited to 7 per cent dividends, which will be used to provide a part of the funds needed for the company's construction program, which during the next ten years includes the development of approximately 1,000,000 hp. on the company's Big Creek project, with appurtenant transmission lines and distribution systems.

This plan will also eliminate the present outstanding $12,029,900 face value of second preferred stock by the issuance in place thereof of $9,500,000 of new 7 per cent preferred stock, thus resulting in an improvement of the position of the common stock by the reduction of $2,500,000 of outstanding capitalization.

## Customer-Ownership Campaign

Announcement is made that the customer-ownership campaign of the New York State Gas & Electric Corporation, which was inaugurated on July 19, is progressing satisfactorily. This company operates in the south central section of New York State, supplying gas and electric service to about 20,000 consumers in the cities of Ithaca, Cortland, Norwich and Oneonta, as well as in twelve villages and eighteen towns. The company is offering 3,000 shares of its cumulative preferred capital stock of no par value, and paying dividends of $7 per annum, at $100 per share, this issue of preferred stock having been authorized by the New York State Public Service Commission for the payment of a 3,000-kw. turbine and a 500-hp. boiler in the power plant at Ithaca; a new water gas set and accessories at Cortland, and the construction of a transmission line between Oneonta, Sidney and Norwich.

## Italian Engineer to Study American Practice

M. G. Soldini, an electrical engineer of Milan, Italy, arrived in this country this week and will devote one year to a study of American central station practice. Mr. Soldini will visit all the principal steam and hydro-electric stations in the United States and some in Canada. He will also make a study of trunk line and suburban railroad electrification. Italy, he points out, possesses no coal, importing all her fuel from England and Germany. On the other hand the northern section of Italy has large water powers, from 3,000,000 kw. to 4,000,000 kw. being available for immediate development. In winter it will be necessary to use steam to supplement this water power. While Italy is now slowly recovering from the war, Mr. Soldini says the possibilities for industrial and railroad electrification are very great.

## Brief News Notes

**Changing Theater Control Board Without Performance Interruptions.**—Changing the control board of the State-Lake Theater, Chicago, without any loss or interruptions of performances, in seven hours' time, is a record set up by the Monroe Electric Company, 35 West Lake Street, Chicago. Although the preliminary work of installing this lighting system required eight weeks between the hours of 8 a.m. and 4.30 p.m., the final insertion of the new 330-kw. Major remote control and pre-selective board was accomplished between the hours of midnight and 7 a.m. One hundred and fifty-six 500-watt border lights were installed between the drop of the curtain at midnight Tuesday and its rise at 11 a.m. Wednesday. This installation required seventy-two new dimmers and 10 miles of wire.

**Utilities Change Ownership in West Virginia and Pennsylvania.**—The American Water Works & Electric Company has recently acquired the Monongahela Power & Railway Company, which operates in and near Fairmont, W. Va., and the Potomac Public Service Company of Martinsburg, W. Va. Stock purchases were made through the West Penn Company. The acquisition of these two properties adds about $8,250,000 to the gross earnings of the American company.

**Utilities Had Fifty-three-Day Coal Supply on June 15.**—A canvass of the coal stocks of the electrical and artificial gas public utilities as of June 15 shows an average of fifty-three days supply on hand, according to a recent announcement of F. R. Wadleigh, Chief of the Coal Division of the Department of Commerce. Also many utilities are receiving current supply from non-union production and, in the opinion of Mr. Wadleigh, utility stocks will last from twelve to fifteen weeks.

**Promoting Industrial Research.**—To arouse national interest in industrial research, Alfred D. Flinn, secretary of the Engineering Foundation and chairman of the division of engineering of the National Research Council, is on a tour of several weeks to the Pacific Coast. Mr. Flinn goes as the emissary of organized research to enlist the aid of engineers of the Far West in a nation-wide plan of industrial research in which the Engineering Foundation, the National Research Council, government departments and the industries will link their efforts. In addition to explaining the purposes of the Engineering Foundation and the National Research Council to the engineers of the West, he will deal with "The Engineer and World Problems," dwelling on the appeal of Dr. B. Stepanek, Minister at Washington of the Czechoslovak Republic, for the establishment in central Europe of "a great American university and library as a center from which could be given out the best products of American culture and which would be a source of correct information about America and American ideas."

**Receivership to Be Vacated Soon.**—Readjustment of the affairs of the subsidiaries of the former American Cities Company, now controlled by the National Power & Light Company, has progressed so satisfactorily that vacation of the receiverships for the Memphis Gas & Electric, Memphis Street Railway and the Birmingham Railway Light & Power Companies is expected before the end of 1922, and possibly within three months in the case of two former companies. The remaining concerns which were in the original combination and later taken over by the National Power & Light, Little Rock Railway & Electric Knoxville Railway & Light and the Houston Lighting and Power companies are reported to be in excellent financial conditions, while their physical properties are said to be in a high state of efficiency.

**Mountain States to Buy Power from California - Oregon.** — The Mountain States Power Company has completed arrangements with the California-Oregon Power Company for the purchase of a large block of hydro-electric power—12,000 kw.—for distribution among its customers in the Willamette Valley, Oregon. Under the terms of the contract the California-Oregon Power Company is constructing a 115-mile transmission line to connect its hydro-electric plant at Prospect, Ore., on the Rogue River with the Mountain States Power Company's substation at Springfield, Ore. The line, which will be operated at 110,000 volts, will cross the foothills of the Siskiyou Mountains.

**German Hydro-Electric Development Again Attracts Notice.**—Owing to the internal industrial stiuation, it is interesting to see how Germany's power requirements are being increasingly met by the use of water and lignite. In 1913, says the London *Electrician*, about 75 per cent of the whole of the electricity supply was produced by ordinary coal, water power and brown coal (lignite) accounting for about 15 per cent of the remainder. It is now stated that only about 15 per cent of black coal is used, the proportion of lignite having increased to nearly 35 per cent. The annual production of lignite in Germany was 11,635,000 tons in 1920, that of black coal being 131,428,000 tons. In eight or ten years it is calculated that, by an extension of existing hydro-electric stations, together with new water-power projects, it will be possible to generate 50 per cent of the whole of the power required for industrial and private uses and for

traction by means of water power alone. In Bavaria and the South German States hydro-electric developments will enable the use of ordinary coal for industrial work to be almost entirely dispensed with and make possible the electrification of the whole of the railways of South Germany.

**Sunbury, Pa., Celebrates an Electrical Anniversary.**—A bronze tablet was dedicated to Thomas A. Edison at Sunbury, Pa., on July 3 in connection with a sesqui-centennial celebration. It was placed on the City Hotel, and the inscription is as follows: "This tablet commemorates the installation at Sunbury, Pa., of the first three-wire central incandescent electric lighting plant in the world, on the night of July 4, 1883. Thomas A. Edison, the creator of the incandescent lamp and inventor of numerous mechanical and electrical devices necessary for a complete system of electric light, heat and power, acting in a triple capacity of chief electrical engineer, mechanical expert and superintendent of construction, turned over to the Edison Electric Illuminating Company of Sunbury, Pa., a completed operating central-station electric plant. The City Hotel, then on this site, was the first building commercially wired for electricity."

**Electricity on an Antipodean Farm.**—An interesting example from Australia of the use of electricity in farming is condensed in the London *Electrician* from the *Industrial Australian*. A farmer in New South Wales has constructed a dam on a small creek near his farm and has erected a Pelton waterwheel giving 17 hp. with the water applied as at present through a 3-in. nozzle. This drives a direct-current dynamo of about 5 kw., which supplies energy for lighting and for fans and radiators in five houses on the farm and in the dairies and other outbuildings, while it also supplies power to a 5-hp. motor which operates a milking machine, sepatator, lathe grindstone, chaff-cutting, corn-shelling and bushnut-shelling machines. A sawmill for heavy work is driven directly by the Pelton wheel, the electrical plant being temporarily disconnected. A novel feature of the electrical installation is that no battery is used, the speed of the generator being regulated by means of wires extending from the farm to the Pelton wheel, a quarter of a mile away, and attached to the valves controlling the water supply to the wheel.

**Signal Corps Gets Nearly Two Million.**—An appropriation of $1,825,000 for telegraph and telephone systems of the army Signal Corps is now available under the War Department appropriation bill passed by Congress and approved by the President for the year which began July 1. For installation and replacement of electric light and power plants at seacoast fortifications in the United States $270,000 is made available; for maintenance and repair of searchlights and electric light and power equipment for seacoast fortifications, tools, electrical and other supplies $110,000; for like equipment at insular possessions $60,000, and for like equipment at the Panama Canal $40,000; for installation and replacement of electric light and power plants at Hawaiian defenses $120,000.

**Louisville Utility Adds 20,000-Kva. Unit.**—Construction work on the Waterside station of the Louisville Gas & Electric Company will be started immediately to make room for another 20,000-kva. unit. The demand for increased generating capacity is seen from the fact that the total connected load in 1914 was only 24,314 hp., whereas at the present time it is 64,046 hp., a gain of over 160 per cent. During the same period the number of customers increased 103 per cent. The kilowatt-hour output for the year to date is running 17 per cent greater than that of last year. This has been caused by a net gain for the first five months of 1922 of 4 266 hp. of motor load and 1,651 kw. of lighting load.

**Tidewater Extends Lines.**—Transmission lines of the Tidewater Power Company will be extended to Warsaw, N. C., a distance of 53 miles, according to announcement by Fred A. Matthes, executive vice-president of the company. Conferences with municipal authorities of the various towns to be covered by the extension have been called for this week. It is also announced that the line will probably be extended from Warsaw to Clinton, in the event the present venture is given the proper support. This is the first move in a development campaign around Wilmington, promised when the company was taken over last spring by the Fitkin interests of New York.

## Associations and Societies

**Michigan Electric Light Association to Hear John F. Gilchrist**—Plans for the ninth annual convention of the Michigan Electric Light Association have developed sufficiently to give promise of one of the most important meetings in the history of the electrical industry in this state. The meeting will be held Aug. 21-23 at Ottawa Beach and inquiries already received by Secretary Herbert Silvester of Ann Arbor indicate a record attendance. John F. Gilchrist, vice-president of the Commonwealth Edison Company, Chicago, a national authority on public relation matters, will be one of the principal speakers at the banquet to be held on the evening of Aug. 22. Gov. A. J. Groesbeck has promised to attend the meeting, provided no important state matters intervene, and give the electric utility men his idea of how they can best serve Michigan.

**Executive Committee of Waterpower Conference in Washington.**—Gathering for the first time since the permanent organization was brought about in Asheville recently, the executive committee of the Southern Appalachian Waterpower Conference will meet in Washington, D. C., this week, Col. Joseph Hyde Pratt, president of the conference, announces. The purpose of the meeting in Washington at this time is to endeavor to secure the passage by Congress of an appropriation totaling $249,000 for a thorough investigation of the Tennessee River, including its headwaters in North Carolina. Necessary steps have been taken to publish in book form the entire proceedings of the Asheville conference.

**Rocky Mountain Electrical Show.**—Plans are being laid by the Rocky Mountain Electrical Co-operative League for a Rocky Mountain Electrical Exposition to be held at Bonneville Park, Salt Lake City, Utah, from Oct. 2 to 14. This league is composed of central stations, manufacturers, jobbers and contractor-dealers and will have the support of the electrical interests from six states. A "Regional" arch typifying the occasion will be designed by W. D'Arcy Ryan of the General Electric Company.

**Engineers' Society of Milwaukee.**—The following have been elected officers of this society for the ensuing year: President, Arthur Simon, Cutler-Hammer Manufacturing Company; vice-president, Fred H. Dorner; treasurer, A. Q. Dufour; secretary, Fred T. Goes.

**Dallas Electrical Club.**—Under the leadership of its president, Joe H. Gill, assistant general manager of the Dallas (Tex.) Power & Light Company, the Dallas Electrical Club has undertaken a general education campaign with the object of better acquainting all members of the club, which include nearly all the men in Dallas engaged in the electrical business, with the affairs of the chief electrical companies of the city. The Dallas Electrical Club has a membership of more than 300 and an average attendance at its Monday luncheons of nearly 200.

### Coming Meetings of Electrical and Other Technical Societies

A complete directory of electrical associations is published in the *Electrical World* in the first issue of each volume. See July 1 issue for latest list.

A. I. E. E., Pacific Coast Convention—Vancouver, B. C., Aug. 8-11.
Michigan Electric Light Association—Ottawa Beach, Aug. 21-23.
International Association of Municipal Electricians—New Bedford, Mass., Aug. 22-25.
N. E. L. A. Geographic Divisions — New England, New London, Conn., Sept. 5-8; Rocky Mountain, Glenwood Springs, Col., Sept. 18; Great Lakes, French Lick Springs, Ind., Sept. 28-30.
Association of Iron and Steel Electrical Engineers—Cleveland, Sept. 11-15.
American Electrochemical Society — Montreal, Sept. 21-23.
Illuminating Engineering Society — Boston, Sept. 25-28.
National Association of Railway and Utilities Commissioners—Detroit, Sept. 26.
Telephone Pioneers of America—Cleveland, Sept. 29-30.
Rocky Mountain Electrical Co-operative League—Salt Lake City, Oct. 2-14.

# Recent Court Decisions

**Mercantile Establishment Demonstrating Machinery Must Guard Clerks from Injury.**—In a suit brought by a clerk who was injured by having her hand caught in an electric washing machine she was demonstrating (Stoll vs. Frank Adam Electric Company) the trial court instructed the jury to find for the defendant, on the ground that mercantile establishments were not included in the law relating to the liability of employers for personal injuries sustained by those working for them in the course of their employment. This finding has been overruled and a new trial ordered by the St. Louis Court of Appeals, which finds "mercantile establishments" to be not only impliedly but specifically included. Contributory negligence was a question of fact for the jury. (240 S. W. 245.)*

**Municipality Cannot Discontinue Commission Proceedings Which It Has Initiated to Acquire Plant.**—The town of Milton, Wis., on Jan. 20, 1920, voted to purchase the water plant of the McGowan Water, Light & Power Company and petitioned the Wisconsin Railroad Commission to value it. Subsequently the commission was notified by the town officials to discontinue hearings, the voters having declared against the scheme. The company insisted on the proceedings being continued, and, on being enjoined, appealed to the Wisconsin Supreme Court, which has decided (Town of Milton vs. McGowan Water, Light & Power Company) that a municipality cannot discontinue proceedings instituted by it before the commission for the acquisition of a waterworks system where such proceedings were instituted by it after the act of 1917. (187 N. W. 661.)

**Conditions Which Customer Seeking to Change Rate Must Fulfill.**—The case of Duquesne Light Company vs. Public Service Commission involved a petition of the late H. C. Frick to the commission to order the Duquesne Light Company and the Allegheny County Steam Heating Company to discontinue discrimination in charges alleged to have been made against him. An order of the commission sustaining the complaint was reversed by the Superior Court and the complaint dismissed. This decree has now been affirmed by the Supreme Court of the state, which declares: (1) A consumer should not have been permitted to file a single complaint attacking separate tariffs of different corporations. (2) Where the consumer expressly stated he did not intend to introduce evidence of the value of the property of public utilities or the reasonableness of the rates, and the utilities thereafter offered evidence tending to show that the rates asked by the consumer would be confiscatory, to which evidence the consumer objected, it was a grave mistake for the commission not to rule on the admissibility of the evidence, since such evidence, unless rebutted, required a dismissal of the complaint. (3) the provision of the public service company law prohibiting rates which are unjust or unreasonable nevertheless permits the utilities to divide their customers into groups according to the purpose for which the service is needed and to subdivide the groups into classes according to quantity taken. (4) When a public utility files its tariff with the commission and the effective date of the tariff passes without objection being made, a presumption arises that the divisions and subdivisions of the customers therein are equitable. (5) Where a customer complains that a public utility is charging him a rate different from that specified in its tariffs on file with the commission, the commission can order the utility to charge only the prescribed rate without notice to any other customer and without considering whether the effect will be to reduce the utility's total revenue below that to which it is entitled. (6) Where the effect of sustaining a complaint would be to alter the tariff of rates on file with the commission, the complaining customer must show that the rates on file are unjust as to him, and also, if he elects to proceed with notice to the utility only, at least that the result of changing the schedule will not deprive the company of the revenue to which it is entitled. (7) When the change in a schedule demanded by a consumer would so reduce the utility's revenue as to be confiscatory, the commission should at once dismiss the complaint or should proceed to examine all the schedules of the utility after such notice to its other customers as is deemed requisite. (8) Special contracts between a public utillity and a consumer cannot, without defeating the purpose of the public service company law, have given to them the effect of continuing in force the rates therein prescribed or as giving the consumer a preference by putting him in a separate class so far as rate making is concerned. (117 At. 63.)

**Failure of Power Company to Render Situation Safe as Soon as It Knew of Broken Wire Negligence per Se.**—Affirming a verdict for the plaintiff in Kidd vs. Kansas City Light & Power Company, where damages were sought for injuries to an eleven-year-old boy who picked up the end of a broken transmission wire lying on the ground, the Kansas City Court of Appeals held that the company was guilty of negligence *per se* because after the breaking of the wire was registered on the instrument kept for that purpose it did not immediately shut off the current on that circuit but instead sent a man to make repairs, the live wire being permitted to remain on the ground for an hour. (239 S. W. 584.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

**Duty of Municipal Plant to Serve Customers Outside City Limits.**—The Wisconsin Railroad Commission held an investigation with respect to the discontinuance of electric service by the city of Manitowoc to three consumers outside the city limits. The evidence showed that service had originally been made to the parties through an intermediate line of another consumer, but this service had been discontinued and the line removed, the owner having contracted for service with the Lincoln Highway Light Company. The commission held that the city owed the three disconnected consumers service and recommended that it arrange with the Lincoln Highway Light Company to connect these patrons with its existing secondary circuit upon payment to the city of a specified line rental by the consumers, such rental to be billed with the regular consumption charge and turned over by the city to the Lincoln Highway Light Company. That company would secure additional revenue thereby without any appreciable additional expenditure, the city would adhere to its policy of avoiding the acquisition or maintenance of property outside of the city limits, and the complainants would secure service upon a more favorable basis than if they were obliged to construct and maintain a separate line.

**Danger of Valuation at Cost of Reproduction New.**—In its valuation of the property of the Virginia Railway & Power Company the State Corporation Commission of Virginia observed: "It may be that in the very near future regulatory bodies will be confronted with proposals from consumers to reduce rates by establishing reproduction values on a unit price level very much lower than that upon which large sums were invested during the high-price period for extensions and enlargements of utility property. It might happen that a valuation then reached on the strict reproduction theory would represent sums materially less than the amounts honestly and prudently invested in the public service. Perhaps, then, the theory of reproduction cost at the time service is given to the public will rise like Banquo's ghost to plague the dreams of utilities, commissions and courts." The commission adopted a plan whereby it began with 1920 property with 1914 prices (less 1914 land), deducting the additions between 1914 and 1920 at 1914 prices, thereby arriving at approximately the 1914 appraisal on 1914 inventory. This 1914 property, including overheads, was appreciated for seven years at 3 per cent compounded. There were then included the additions from 1914 through 1921 at actual cost.

# Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

## Southwestern N.E.L.A. Elects E. H. Kifer President

The Southwestern Division of the N.E.L.A. has recently elected as president E. H. Kifer, vice-president and general manager of the San Antonio Public Service Company. Mr. Kifer

E. H. KIFER

has been prominent in association work for several years past. He was born in Lincoln, Neb., June 8, 1884, and was graduated from the University of Wisconsin in 1908 as an electrical engineer. Prior to graduation he had been employed by the Madison (Wis.) Gas & Electric Company, and upon graduation he continued with the same company, being appointed superintendent of the electrical department in 1910. In 1912 he was promoted to be general superintendent and held this position until 1916. In 1918 he was elected vice-president and general manager of the San Antonio (Tex.) Public Service Company, which position he still holds. Mr. Kifer was chairman of the Madison Section of the A.I.E.E. in 1915 and a member of the national membership committee of the N.E.L.A. in 1914.

## G. E. Armstrong Enters Manufacturing Field

G. E. Armstrong, who has been the Pacific Coast editor of the *Electrical World* for the last two years, has resigned to become the representative in Los Angeles of the Garland Affolter Engineering Company, manufacturers' agent. Mr. Armstrong was a member of the 1914 class of the University of California, and upon leaving college he entered the employ of the Southern California Edison Company as assistant to the superintendent of generation. Later he was assistant superintendent of transmission and then protection engineer and assistant to the chief electrical engineer. Mr. Armstrong is widely known through his technical writings and his activities in the technical and other electrical societies. He has served on numerous committees of the A.I.E.E. and the Pacific Coast Electrical Association. For many years he has been a member and secretary of the technical committee of the latter association. Upon leaving the Southern California Edison Company he was associate editor of the *Journal of Electricity and Western Industry* until he joined the staff of the *Electrical World.*

## H. Carl Wolf Chief Engineer of Maryland Commission

The recent promotion of H. Carl Wolf to be chief engineer of the Public Service Commission of Maryland is a recognition of his service as assistant chief engineer. He received his training in electrical engineering at the University of Illinois, from which he was graduated in 1913, later receiving his master's degree and the professional degree of E. E. from the same institution. After serving as assistant engineer in the engineering department of the Illinois Public Utilities Commission, he took over the management of a public utility property in Illinois.

During the war Mr. Wolf played an active part, mostly abroad, as an officer

H. C. WOLF

in the Engineer Corps, first in designing electrical installations for the American Army and later as electrical engineer for the base section around Marseilles. When the American Peace Commission was engaged in the valuation of damage done by the Germans to the public utilities of France, Mr. Wolf was associated with the engineering department. Upon return to civil life he went into industrial engineering work with Griffenhagen & Associates, Ltd.

## R. F. Pack New Fourth Vice-President N.E.L.A.

It seems only proper that after thirty-one years' experience in the electric light and power industry, during which time he has been intimately interested in the work of the national technical associations, Robert F. Pack

R. F. PACK

should have been elected fourth vice-president of the National Electric Light Association at its recent convention held in Atlantic City. His becoming one of the official leaders of the association will bring into play an experience in association work which only a few men in the industry possess. Mr. Pack served as president of the Canadian Electrical Association in 1912, and while holding this office he was instrumental in bringing about the affiliation of the Canadian Electrical Association with the National Electric Light Association. He has, besides, been influential in his service to the industry in that he is an active member of the American Institute of Electrical Engineers. During the war he was appointed by the Governor of Minnesota to represent employers on the State Board of Arbitration, which consisted of three members.

Mr. Pack was born on the Isle of Wight, England, Oct. 1, 1874, and was intended for the British Navy. Before his education was completed, however, his parents moved to Canada, taking their son with them. He entered the service of the Toronto Electric Light Company in 1891 as office boy and had the unusual experience of filling nearly every position in the company, including that of general manager. His success as an executive attracted the attention of H. M. Byllesby & Company, who in 1912 made him general manager

of the Minneapolis General Electric Company. In 1916 he was appointed vice-president and general manager of the Northern States Power Company, also a Byllesby subsidiary.

## Lunn Elected a Manager of the A. I. E. E.

Ernest Lunn, chief electrician of the Pullman Company, has been elected a manager of the American Institute of Electrical Engineers. Mr. Lunn was born in Greenville, Mich., June 23, 1874, and was graduated from the University of Michigan in 1899 as electrical engineer. Upon graduation he became connected with the Detroit Edison Company. In 1902 he went with the Commonwealth Edison Company as storage-battery engineer, serving in this position for twelve years except for seven months in 1910 when he was employed by the Firestone Tire & Rubber Company of Akron, Ohio. Mr. Lunn has been connected with the Pullman Company since 1914 as chief electrician. From 1903 to 1914 he was successively secretary-treasurer, vice-president and general manager and president of the Walker Vehicle Company of Chicago. He is a member of a number of national technical societies.

ERNEST LUNN

**Harry H. Martin**, vice-president of the Bankers' Trust Company, has been elected to the directorate of the International Radio Corporation.

**F. D. Mahoney**, for several years commercial manager of the Alabama Power Company, has resigned to accept the vice-presidency of the Western Pennsylvania Electric Company, with headquarters at Pittsburgh. He leaves at once to begin his new duties.

**F. A. Nobbe** has been presented with a silver service by the Louisville Gas & Electric Company in recognition of his record of fifty years' continuous service with that company. His first position was with the Louisville Gas Company, a predecessor of the present company, and is at present assistant secretary and assistant treasurer.

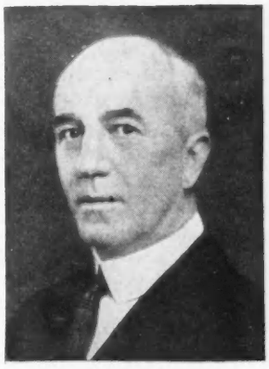
**A. M. Perry**, engineering editor of the *Electrical World*, has been elected a manager of the New York Section of the Illuminating Engineering Society for the fiscal year beginning Oct. 1, 1922.

**Thomas A. Edison** was recently honored by Rutgers College, New Brunswick, N. J., at its one hundred and fifty-sixth annual commencement. Mr. Edison was given the degree of doctor of science, not bachelor of science, as was announced in the July 1 issue of the *Electrical World*.

**Frederick J. Dunn** has been elected president of the Gardner Electric Light Company, Gardner, Mass. Mr. Dunn was at one time judge of the First District Court of Massachusetts, resigning to go to Worcester, where he became identified with the Connecticut River Power & Transmission Company. He succeeds his father, Thatcher B. Dunn, who at the time of his death was president of the Gardner Electric Light Company.

## Arkwright Member Executive Committee N. E. L. A.

P. S. Arkwright was elected a member-at-large on the executive committee of the National Electric Light Association at its recent convention in Atlantic City. Mr. Arkwright brings a wide executive experience to the association by reason of his twenty years' presidency of the Georgia Railway & Power Company. He was born in Savannah, Ga., in 1871, and was graduated from the University of Georgia in 1890 with the degree of B.Ph., and also from the University of Georgia Law School in 1891 with the degree of LL.B. Mr. Arkwright practiced law in Atlanta from July, 1891, to January, 1902. At the latter date he was elected president of the Georgia Railway & Electric Company on its organization. He continued in this capacity until about March, 1912, when the property of this company was leased to the Georgia Railway & Power Company.



P. S. ARKWRIGHT

## Barrows Made a Vice-Chairman Public Relations Section, N.E.L.A.

Edwin A. Barrows was elected a vice-chairman of the Public Relations section of the National Electric Light Association at its recent convention in Atlantic City. Mr. Barrows is unusually well qualified for this executive position with the association by reason of his thirty-two years' experience in relations with the financial and general public. He was born and educated in Providence, R. I., and was graduated from Brown University in 1891. His business training was acquired with the Rhode Island Hospital Trust Company, with which he became identified shortly after graduation. In 1902 he severed his connections with the trust company to become national bank examiner for the districts of Rhode Island and Connecticut. From this appointment he resigned in 1904 to become secretary-treasurer of the Narragansett Electric Lighting Company. In 1915 he was elected vice-president and in January, 1916, president.

E. A. BARROWS

**R. E. Fisher**, vice-president in charge of the sales of the Pacific Gas & Electric Company, has been nominated to the board of directors of the California Development Association.

**A. Emory Wishon**, general manager of the San Joaquin Light & Power Corporation, Fresno, Cal., has been nominated to the board of directors of the California Development Association.

**Sumner R. Keyes**, for the last eleven years head of the standardizing division, department of standardizing and testing, Edison Electric Illuminating Company of Boston, has been appointed assistant superintendent of the purchasing department of that company.

**Brig.-Gen. John J. Carty**, vice-president of the American Telephone & Telegraph Company, received the honorary degree of doctor of engineering from New York University at its graduation exercises held June 6. This is a very unusual degree and is conferred for only unusually meritorious services.

# Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

## The Jobber's Territory—What Should It Be?

### Suggesting a Basis for Calculating How Far the Salesman Should Be Sent—A Matter of Financial Capacity

By O. Fred Rost
General Manager Newark Electric Supply Company, Newark, N. J.

THE most common mistake we make today in the jobbing business is probably trying to serve too great a territory. We send our men out through the neighboring states to get business. We route their trips to towns where we believe they can get orders. That is the point of view from which we do our planning. We forget entirely that what they should be doing is adequately covering the population that we can efficiently and profitably serve. For there must be some limit to the area that an organization should travel. Beyond a certain point the expense is too great to make it pay. What is this limit for each one of us?

#### Per Capita Ratio

When I became manager of this supply house seven years ago, our men were traveling into New York State, Connecticut, one-half the State of Pennsylvania and all New Jersey. The fact that Philadelphia and New York City jobbers can naturally serve parts of this area far more economically than a house in Newark had been disregarded.

It seemed to me that the first thing was to decide how great a population we could afford to serve, and as the result of experiments covering a period of years, I finally arrived at this conclusion—that a jobber, to ascertain the territory in which he can perform his function economically, should map out an area which has a population about the equal of his gross annual sales in dollars.

This simply means that if he desires to restrict his territory without material loss in the volume of business and he does now a $250,000 business, he should make his territory embrace approximately a 250,000 population. If his sales total $500,000, he should not try to cover much more than a 500,000 population.

Coming back to our own experience: We proceeded to reduce our territory to northern New Jersey, the area that we could serve at least as quickly, easily and economically as anybody else. Our salesmen all cover their districts in Ford coupes and sleep at home. Only one man has to be gone several days at a time. This extreme concentration, of course, is made possible by exceptional conditions, and it is impossible to many jobbers because of less density of population in the respective territories. But the principle of using per capita ratio as a guide to determine the territory upon which to concentrate applies to every one.

O. F. ROST

#### Too Much Waste Time

The average jobber's salesman travels too far. He spends too much of his time on trains and street cars. He goes to too many towns because he "wants to take care of" perhaps one good customer, whereas he might better stay right where he was and work to make good customers out of the other prospects who are not buying. He can only get orders by calling on people. While he rides, he sells nothing. His capacity to call is limited by the hours of the day. Therefore he should sell the greatest possible number who are located conveniently near his shipping point.

Take a jobbing house that travels six states and does a million dollars worth of business annually. Let them cut down to the most easily served surrounding territory of about a million population. Let them spend the same money and effort, the same number of salesmen calling oftener on more customers, the same advertising appropriation concentrated on the smaller list. By the end of the year they would have made more money and more easily.

#### How to Go About It

The jobber in the smaller city, with his towns more scattered, does not serve so large a population but his need to concentrate on the population that he can economically serve is even greater. It will pay him to study his map and find out what area will provide the population that he can afford to serve on the one dollar per capita per year ratio to his present volume of business. Then let him reshape his salesmen's districts so that instead of their spending half their time traveling *to* their customers they can spend more time *with* them. The results will be surprising.

The salesmen will not so constantly be hurrying off to catch trains and will be able to serve their customers in more of the little ways that in the past they have had to neglect—little ways that make closer friends and develop more dependence on the jobber. The manager can keep in closer touch with what his men are doing and is in closer contact with his customers. Deliveries will be quicker, collections will be easier, traveling expenses will be less and salesmen will like it better because they can sell more goods with less hardship.

In normal times a successful jobber will double his business every four

years. The expansion of the industry, the growth of population, the increasing use of electricity, and, of course, particularly his own effort, will bring a 25 per cent gain each year unless he is slipping somewhere. But he cannot do this if he tries to cover a greater territory than he can economically serve. Also, every jobber owes the industry a degree of service. If he cannot serve some territory as well or better than anybody else, he has no right to exist. But that area in which he can function efficiently and economically is his *natural* territory and he should work here extensively.

The one dollar per capita basis of determining at the outset a jobber's natural territory will prove quite satisfactory. But, of course, this does not mean that a territory will produce only one dollar per capita per year for each jobber. For instance, in our territory are located three real jobbers and twenty others who claim to be jobbers. Yet, we are making better than our one dollar per capita ratio. I figure the dollar per capita merely as the limit beyond which a jobber should not extend his territory at the time when he decides to confine operations to his *natural* territory and makes restriction of territory effective.

### Financial Capacity

The important point is, that a jobber should know how much territory his financial and other capacities enable him to cover economically and effectively, and then restrict himself to that. Then he can employ his financial capacity to the utmost advantage, and gain the greatest possible reward from operations within the natural boundaries of his activities.

Poaching upon the other fellow's rightful field generally involves extraordinary expenditures in time and effort. A careful study will prove to any jobber that most business taken outside of his natural territory adds nothing to his assets but materially increases his liabilities. It does not pay any business to try to live beyond its income.

# Importation and Progress in Scientific Instrument Development

By James Biddle
Biddle & Company, Philadelphia, Pa.

THE tariff bill—designated H. R. 7456—now before our Senate in Washington may well be of concern to users of scientific instruments because of the high rates of duty proposed. Under the present Democratic tariff, which became effective in 1913, the ad valorem rate for scientific instruments in general is 20 per cent, and also there is provision for duty-free importations by universities, colleges and schools.

The Payne-Aldrich act, which prevailed prior to 1913, imposed a duty of 45 per cent on scientific instruments but also allowed for duty-free importations for educational purposes.

By comparison it is rather significant that the ad valorem rate in H. R. 7456 has been put at 55 per cent, and also the time-honored practice of permitting educational institutions to import on a duty-free basis has been omitted. Consequently, as compared with both present and past tariffs, the proposed rate for scientific instruments is much increased, while those who have occasion to use them for educational purposes will have to pay more than "half as much again."

It is claimed that the scientific instrument business is a "key industry" and that the United States was seriously handicapped during the late war because of not manufacturing devices that were absolutely essential and which we had been in the practice of obtaining from abroad. To avoid such an embarrassment in the future we are told that a high rate of duty must be imposed, to encourage the development and manufacture of such apparatus in the United States.

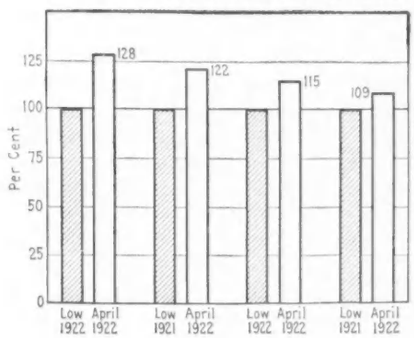
### Non-Competitive Meters

As opposed to this idea, I would submit the unmistakable fact that there is a great variety of scientific instruments now made abroad, in comparatively small quantities, noncompetitive with goods of American manufacture, and for which the demand is so limited as not to invite production here. In such cases, whatever tariff is levied becomes the equivalent of a tax and affords no real "protection."

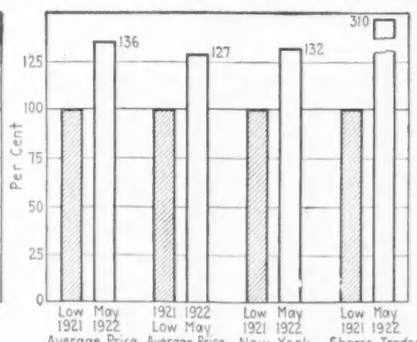
Whenever, as a business proposition, it is worth while to do so, and especially when there is need for quantity production, we have ample evidence that American instrument makers can compete with the civilized world, irrespective of the tariff rates.

A notable instance is the line of superior electrical measuring instruments devised by Dr. Weston more than thirty years ago, and in con-

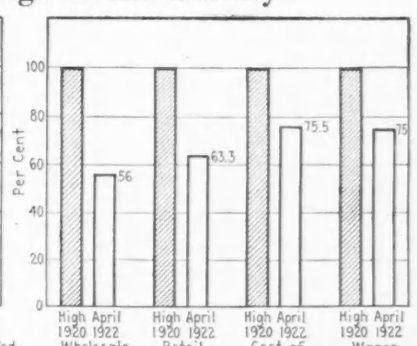
## Charts Show General Business Conditions Throughout the Country




Increase in Volume of Trade Compared to Low Points of 1921 and 1922. Low, 1921 or 1922, Equals 100




Revival in the Security Markets, 1921 Low Equals 100




Decline in Prices and Wages 1920 to 1922. 1920 High Equals 100

(Figures in the above charts were compiled by the *Chemical Bulletin*)

nection with the sale of which I believe the makers have never been disturbed by competition from abroad, even in the face of possible duty-free importations by universities and colleges.

As another illustration I would mention X-ray tubes, which, in so far as concerns manufacturing skill, are rather peculiarly a German product. To-day "Coolidge" tubes are produced in Schenectady and sold everywhere at prices which entirely ignore competition. Probably they would find just as ready a market in the United States if X-ray tubes of foreign makes were admitted without duty, because the "Coolidge" article is in a class by itself as to results in service.

Pyrometric instruments are another example of what I have in mind. They have been developed so highly in the United States as to fear nothing from foreign competition, whatever rate of duty might be determined for them.

It is my opinion, therefore, we can afford to have the business of manufacturing scientific instruments placed in such a position that success will depend upon design, quality of workmanship and performance, rather than upon price. It has been demonstrated abundantly that our engineering scientists can accomplish almost any task which warrants their attention, and I am confident that no benefit commensurate with the possible burden will follow the placing of a high tariff on instruments made abroad, or by prohibiting duty-free importations on behalf of educational institutions.

## Summary of Reports from 71 Telephone Companies Issued

Summary of reports of seventy-one large telephone companies for the month of April of this year has been compiled by the Interstate Commerce Commission. This summary includes companies having annual operating revenues in excess of $250,000. The table of the commission shows that at the end of April, 1922, 10,004,799 company stations were in operation in comparison to 9,536,427 at the end of the same month in 1921. This shows an increase of 468,372 company stations.

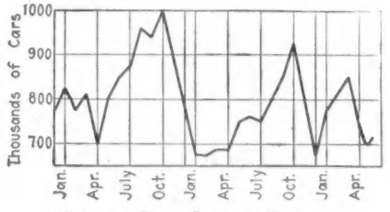
Revenues for April were: Subscribers' station revenues, $31,190,047; public pay station revenues, $2,184,795; miscellaneous exchange service revenues, $404,448; message tolls, $11,930,045: miscellaneous toll line revenues, $1,339,209; sundry miscellaneous revenues, $791,258; licensee revenue, Cr., $1,709,854 and licensee revenue, Dr., $1,707,013. Total of these telephone operating revenues amounts to $47,842,643.

Expenses were: Depreciation of plants and equipment, $7,028,041; all other maintenances, $6,658,375; traffic expenses $13,149,772; commercial expenses, $4,412,505; general and miscellaneous expenses, $2,334,466, and telephone operating expenses, $33,583,159.

## Freight Cars Loaded Last Week Totaled 877,856

Cars loaded with revenue freight in the week ended June 24 totaled 877,856, according to reports received by the American Railway Association. This represented a gain of 17,084 cars over the preceding week, and the total of the latter period was the largest reported since October 22, 1921.

As compared with the preceding week, loadings of all classes of freight increased with the exception of grain and grain products, which dropped only 922 cars. Ore shipments totaling 64,284 cars represented an increase of 10,462 cars over the previous week, while gains of 4,824 and 1,584 cars, respectively, were recorded in coal and merchandise freight.




FREIGHT CARS LOADED DURING 1921 AND 1922

## Collections in Atlanta Section Improve

Electrical Jobbers in the Atlanta, Ga., section report collections as considerably improved, though credit is extended with even greater caution, due to the number of small electrical dealers springing up over night, particularly since the radio has come into such popularity. Commercial failures in the Sixth Federal Reserve District in May were substantially smaller, both in number and in total of liabilities, than during April, and liabilities less, though the number was larger, than during May last year.

## Says Radio Slump Is Boon to Entire Industry

"The present slump in the radio business during the summer months is a boon to the entire industry," declares Joseph D. R. Freed, president of the Freed-Eisemann Radio Corporation. "Both the radio dealers and the more stable and serious radio manufacturers are learning a well-needed lesson from this slump."

"For example," continued Mr. Freed, "dealers are beginning only now to realize the truth of the fact that they cannot afford to carry a large and heterogeneous lot of odds and ends in radio apparatus in the hopes that they will be able to dispose of it. They are learning now, by a stern process, that hysterical overstocking of apparatus in an effort to meet the spasmodic demand is not going to prove profitable in the long run.

"Manufacturers, too, are learning their lesson from this slump. They are learning now, if they didn't know it before, that in order to sell radio apparatus, they must give good value, serviceable merchandise, attractive prices and real service and dealer cooperation. Competition is very keen and hitherto there has been too little of this healthy form of competition."

## Failures Show Decided Decrease in Number

The decrease in the number of failures reported for last week is greater than would seem to be explainable by the five-day business week in the United States, due to the observance of the Fourth of July.

The number of defaults reported to R. G. Dun & Company this week totaled 306, compared with 364 for the previous week; the figure for the corresponding week a year ago was 290.

As against 7,517 defaults for $218,012,365 of indebtedness during the first quarter of this year, the second quarter's reports disclose 5,867 insolvencies for $155,703,973, exclusive of banking and other fiduciary suspensions. Thus, the statistics for the latest period reveal a decline of about 22 per cent in number of failures and a contraction of more than 28 per cent in amount of liabilities from those of the first three months of the present year, and the June defaults, 1,740 in number, mark the smallest monthly total which has occurred since last October.

## Active Demand and Low Stocks Cause Conduit Advance

Active demand and depleted stocks brought on by heavy summer construction have caused general price advances in the conduit market in important centers of the country during the past week. The average decrease of two points in the discount lists amounts to about a 4 per cent advance in quotations.

In the New York district a majority of jobbers report excellent sales. Shipments for the last two weeks have been normal, and no fears of depleted stocks have been heard. In Chicago, the ½-in. black pipe sells for $45 per 1,000 ft. in 5,000-ft. lots. Active demand with low stocks and slow shipments is causing some anxiety in this market. In Atlanta a price advance of two points has not caused any let-up in demand, all jobbers reporting strong sales.

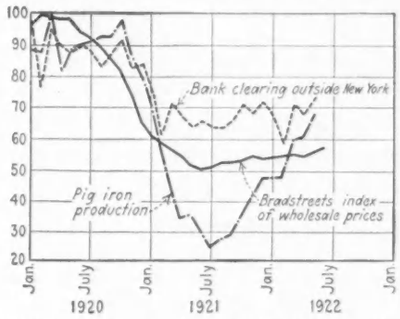
## Apparatus Manufacturing in England Decreased

Simultaneously with the diminishing of activities in industry generally, the manufacture of electrical apparatus in Great Britain experienced a gradual slowing down from the middle of 1920 until the end of the year 1921, according to reports recently issued by the Department of Commerce. At the same time, work was going forward step by step in the development of plans for the future electrification of Great Britain industrially and domestically, with particular attention paid to railroad electrification.

The 1920 production of electrical machinery and apparatus, exclusive of telephone apparatus, but including all types of cable, was in quantity about the same as that produced in 1913, but the values were increased 100 per cent, 1913 production totaling about £22,500,000 and 1920 about £45,000,000. Approximately 33⅓ per cent of these goods was exported. A rough division of the 1920 total production indicates that 45 per cent was made up of machinery (including small motors), 35 per cent of cables and 20 per cent of supplies and accessories. In 1921 the total production dropped to £35,000,000, of which £18,000,000 worth was for export. Machinery production suffered the larger part of this drop, the business in cables being quite well maintained by overseas trade and the production of lamps continuing on a fair scale because of domestic demand.

## Bank Clearings Continue to Show Gains Over 1921

Returns of bank clearings this week are for five business days only, owing to the holiday. The statistics for twenty cities in the United States, as reported to *Dun's Review*, show an aggregate of $6,520,252,000, which is 11.6 per cent in excess of the $5,842,802,612 of the corresponding period of 1921.




BANK CLEARINGS, OUTSIDE NEW YORK, PIG IRON PRODUCTION AND BRADSTREET'S INDEX OF WHOLESALE PRICES ARE SHOWN IN THE ABOVE CHARTS

Average daily bank clearings for July to date and for preceding months are given here for three years.

| | 1922 | 1921 | 1920 |
|---|---|---|---|
| July | $1,304,050,000 | $1,168,560,000 | $1,321,932,000 |
| June | 1,155,786,000 | 990,131,000 | 1,279,333,000 |
| May | 1,143,911,000 | 982,676,000 | 1,331,217,000 |
| Apr. | 1,115,478,000 | 957,996,000 | 1,321,113,000 |
| Mar. | 1,042,360,000 | 975,088,000 | 1,321,007,000 |
| Feb. | 1,052,112,000 | 1,060,726,000 | 1,322,870,000 |
| Jan. | 1,087,235,000 | 1,190,774,000 | 1,374,249,000 |
| | 1921 | 1920 | 1919 |
| Dec. | 1,095,600,000 | 1,255,276,000 | 1,409,930,000 |
| Nov. | 1,091,856,000 | 1,291,574,000 | 1,444,048,000 |
| Oct. | 1,070,232,000 | 1,343,698,000 | 1,392,663,000 |
| Sept. | 969,200,000 | 1,214,388,000 | 1,351,396,000 |
| Aug. | 877,464,000 | 1,135,201,000 | 1,192,969,000 |

## Prohibit Radio Apparatus Sales in Constantinople

The Department of Commerce is advised that the President of the Allied Police Commission at Constantinople has published a notice prohibiting the sale of wireless apparatus in Constantinople and in the zone of Allied military occupation. The notice permits the sale of wireless apparatus outside of the zone occupied by the Allies, but requires firms wishing to make such a sale to obtain permission from Headquarters, Allied Police Commission, Constantinople, before making delivery of the goods, giving the name and full particulars concerning the buyer and of the destination of their apparatus.

According to Consul Harold D. Clum, of Santiago, Cuba, there is an increasing interest in that city in radio telegraphy and telephony, and it is intended to install a broadcasting station powerful enough to be heard in every town in Oriente Province.

The majority of receiving stations now in use have been constructed by amateurs or assembled from parts obtained from the United States, but as American firms are oversold, much difficulty has been experienced in getting deliveries on orders placed in this country.

The proximity of Cuba to the broadcasting facilities of the United States adds to the possibilities for developing a market there for radio sets.

## Metal Market Situation

Much improvement in the copper market was noted during the past week. Good tonnage of electrolytic has also been sold for September delivery at 14 cents, showing the strong price to apply generally. Price of lake copper for domestic shipment is 14 to 14½ cents a pound delivered for July, August and September.

June sales of copper, foreign and domestic, are estimated at around 140,000,000 lb. by men in close touch with the industry. This compares with 200,000,000 to 210,000,000 lb. sold in May, and 140,000,000 in April. It is estimated that foreign sales by Copper Export Association and independents totaled between 60,000,000 and 70,000,000 lb., or slightly under half of the business for the month.

Sales for the second quarter of 1922 totaled 480,000,000 lb., it is estimated, or at the average rate of 160,000,000 lb. a month, compared with 350,000,000 lb. for the first quarter, or an average rate of about 115,000,000 lb.

Price table follows:

NEW YORK METAL MARKET PRICES

| Copper | July 5, 1922 | July 12, 1922 |
|---|---|---|
| London, standard spot | £ s. d. 63 2 6 | £ s. d. 63 2 6 |
| | Cents per Pound | Cents per Pound |
| Prime Lake | 13.87½ | 14.00 |
| Electrolytic | 13.75 | 13.87½–14.00 |
| Casting | 13.25 | 13.35 |
| Lead, Am. S. & R. price | 5.75 | 5.75 |
| Antimony | 5.05 | 5.05 |
| Nickel, ingot | 36.00 | 36.00 |
| Zinc, spot | 5.45 | 5.50 |
| Tin, straits | 31.50 | 31.37½ |
| Aluminum, 98 to 99 per cent | 19.10 | 19.10 |
| OLD METALS | | |
| Heavy copper and wire | 10.50–11.00 | 10.50–11.00 |
| Brass, heavy | 5.50– 5.75 | 5.50– 5.75 |
| Brass, light | 4.87½–5.00 | 4.87½–5.00 |
| Lead, heavy | 4.62½–4.65 | 4.62½–4.65 |
| Zinc, old scrap | 2.87½–3.00 | 2.87½–3.00 |

# The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

SALES of electrical materials to industrial and manufacturing plants are steadily increasing, reports from all over the United States indicate. Conduit prices advanced about 4 per cent during the past week. Transformer sales for customer substations are reported excellent. Fan sales have fallen off greatly and jobbers report very light demand for this time of the summer. Some manufacturers of outlet boxes have announced an increase in prices from 15 to 16 per cent. Despite the summer lull and poor static conditions, radio equipment business is holding up well in most sections. Cable and wire demand maintains strength and deliveries are becoming longer, three months being required on certain grade of high tension cable orders in the St. Louis district. Dealers report a better demand for cleaners and washers and more response to sales initiative. A steady call for good grades of lighting fixtures continues due to the large construction programs. The industrial lighting market, a trifle sluggish at this time, is expected to become active in a few months. Floor lamps moved slowly last week.

## New York

### Industrial Business on Increase—Conduit and Outlet Boxes Higher—Fan Sales Slow

Conditions in the electrical trade this week remain at about the same levels as last noted, although in some quarters there is perhaps slightly less activity. To offset this, however, are the reports by jobbers that their sales to industrial and manufacturing plants are steadily increasing. Jobbers specializing in that class of business are particularly encouraged by the way their sales have held up for the past month or six weeks. One jobber stated that his June sales were the largest in the history of his business and sales so far this month are showing up equally as well.

Prices generally are unsettled. Quotations on flexible armored conductor are easier, while conduit manufacturers have advanced the price of pipe about 4 per cent. An increase in outlet boxes has also been announced. Stocks are in good shape.

**Rigid Conduit.**—Manufacturers have announced an increase in the price of pipe. Card No. 51, decreasing the discount by two points, became effective July 5. This is an increase of approximately 4 per cent. Under the new schedule quotations are as follows: For ½-in. black pipe in 2,500-ft. lots, $47.94; ¾-in., $61.41, and 1-in. $87.38 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities are $53.04, $68.31 and $97.58 per 1,000 ft. Not all jobbers have made these prices effective as yet.

**Rubber-Covered Wire.** — Quotations remain unchanged. No. 14, two-wire, single-braid sells for $6.25 to $6.50 per 1,000 ft. in 5,000-ft. lots. Demand is fair and jobbers are inclined to hold their stocks, apparently in expectation of a better market.

**Flexible Armored Conductor.**—Sales are good and most jobbers' stocks are ample to large. A good deal of business is being done on competitive prices, and quotations show considerable variation. Two-wire, single strip is quoted from $41.50 to $43 per 1,000 ft., and double-strip from $44 to $47 per 1,000 ft. for that quantity.

**Outlet Boxes.**—Effective July 15 some manufacturers have announced new list prices on boxes increasing the price between 15 and 16 per cent.

**Fans.**—Sales have fallen off sharply and jobbers report a very light demand at this time.

## Chicago

### Conduit Prices Advance, Stocks Lower—High Tension Business Active—Cleaner Demand Improving

The electrical trade is steady and prices on wiring materials have strengthened due to increased steel costs and uncertainties arising from the coal strike. Business in high-tension pole-top switches and farm-light equipment is active. Home lighting fixtures of better grades are favored by the buying public. Demand for industrial lighting fixtures has not fully developed. Action on heating appliances is unaffected by recent price change. Sales efforts on cleaners and washers are producing better results since people seem more open for this type of merchandise.

**Conduit.**—Price of conduit has advanced. The ½-in. black pipe now sells for $45 per 1,000 ft. in 5,000-ft. lots. An active demand together with low stocks and slow shipments from manufacturers is creating some anxiety in this market.

**Flexible Armored Conductor.**—Movement has been steady without any pronounced sales. No. 14, two-wire, single-strip in 5,000-ft. lots still sells for $42.50. Stocks are ample.

**Wire.**—Rubber-covered wire is gradually strengthening although the No. 14 is still available in 5,000-ft. lots for about $6.25 per 1,000 ft. Stocks are fair. Bare and weatherproof wire ranges around 16¾ cents per pound, but demand is rather sluggish.

**High-Tension Equipment.** — Orders for two 44,000-volt, 2,400-kva., steel tower outdoor substations for the South and six 2,200-volt, 500-kva. substations for the Northwest were received by one company. This company reports a 32 per cent increase in June business over that of June, 1921. Another firm sold twelve 37,000-volt lightning arresters to a utility in California.

**Fixtures.**—Call for good grades of home lighting fixtures is steady due to activity in building industry. Action on industrial lighting, while a little sluggish, is expected to become active in the fall. Floor lamps are moving slowly.

**Fans.**—Cool weather has hindered active trade in fans. All dealers are well supplied with stocks.

**Cleaners and Washers.**—Dealers report action picking up and more response to sales initiative than previously. One dealer reports his sales are ahead of last year's. Cleaners are moving best.

## Boston

### Ranges and Electric Refrigerating Plants Orders Active—Lamp Demand Reported Unusually Good

Electrical apparatus makers report better business, the payroll of one large plant near Boston has been increased to 9,000 employees, the 1920 peak being about 13,000. Ranges and electric refrigerating plants are moving actively. Prices are stiffening somewhat on rigid conduit and flexible armored conductor.

**Refrigerating Machines.** — Active sales are reported, recent orders covering about 70 outfits for Boston apartment houses.

**Lamps.**—Manufacturers' stocks are being built up to meet the anticipated heavy fall business. Trade is unusually good for this season, dominant sales covering 25, 40 and 50-watt ratings. Prices steady.

**Wire.**—Bare copper wire is very dull, but weatherproof is moving faster, central-station buying on a 16.5-cent base featuring the market. Rubber-covered wire is moving slower around $6.25 per 1,000 ft. in 5,000-ft. lots. Sharp competition prevails.

**Ranges.**—Twenty-one ranges have been sold for apartment service by a Boston distributer on a single order. Deliveries are excellent and interest in this class of equipment is increasing. Vigorous competition in bids is apparent.

**Sockets.**—A steady demand is being served from stocks, easily meeting the current requirements. In case lots, pull sockets sell at 32 cents each, keys moving at 18½ cents and keyless at 17 cents.

**Magneto Sets and Motor Starters.**—Business is improving in this line, notwithstanding a somewhat spotty automobile trade. One factory reports monthly gross earnings at $900,000

compared with $476,000 in February. Sales for farm tractor equipment are fairly good.

**Flexible Armored Conductor.**—Buying is active for new building construction and stocks are in excellent shape. Single-strip No. 14 quotes $60 per 1,000 ft. on less than coil lots and $44.20 per 1,000 ft. in lots of 1,000 ft. or more. Corresponding double-strip prices are $65, $55 and $48.

**Appliances.**—Electric irons are moving exceptionally well in the retail trade. Toasters are in fair demand and washers are moving better than of late in cases where vigorous sales effort is being applied. The demand for electric radiators for summer homes is dull and fan sales are sluggish on account of adverse weather.

## Atlanta

**Industrial Motors Market Slow—Panel Boards in Good Demand—Oil Switches Dull**

Considerable irregularity is to be noted in conditions in the Southeast, but the general opinion seems to be that progress is being made toward normalcy. Electrical jobbers report their line as steadily improving, with an excellent business being done in fans and wiring materials. Weather conditions are excellent for the picking of the peach crop and shipments are going forward in large quantities.

Building activity in this section shows no signs of lagging, most of the cities reporting substantial increases in the number of permits.

**Portable Drills.**—As was expected, the increased activity in the automobile trade is being reflected in the movement of this specialty, jobbers in this section reporting the movement as good. Very satisfactory stocks are on hand and no recent price changes are reported.

**Industrial Motors.**—This line shows up as rather slow, though the number of inquiries is satisfactory. Stocks of the standard lines are in good shape and all shipments satisfactory.

**Panelboards.**—The continued building activity has created an excellent demand for the specialty, one of the largest jobbers reporting his stocks entirely depleted. No changes in prices are reported and shipments are good.

**Fuses.**—As expected at this time of the year, this line is showing up only fair. Jobbers' stocks are in good shape and shipments satisfactory.

**Radio Equipment.**—Despite the summer lull, this line is holding up in a desirable manner.

**Oil Switches.**—The dullness in the movement of industrial motors is reflected in this line, jobbers reporting only a fair number of orders, though a brisker movement is anticipated within the next thirty to sixty days.

**Porcelain.**—Jobbers report this line slow, with ample stocks on hand. Representative prices are: Nail-it knobs, $18 per 1,000; split knobs, $12 per 1,000; unglazed cleats, $13 per 1,000; tubes, $\frac{5}{16}$ in. x 3 in., $5.60 per 1,000 in barrel lots.

**Conduit.**—A price advance of 2 points has not tended to slacken the movement in this line, all jobbers reporting excellent sales. Recent shipments have brought stocks up to normal.

## St. Louis

**Cable Demand Is Strong—Transformer Sales Exceptionally Good—Socket Market Better with Stocks Ample**

Increased construction activity is shown in building permits for June, which amounted to $2,436,755, as compared with $2,396,880 for May and with $2,150,069 for June of last year. Industrial construction is becoming more important. Consumption of electric current for June is reported by Union Electric Light & Power Company to be 16 per cent heavier than for June of last year, occasioned principally by increased industrial usage.

Agricultural conditions continue good, except that the wheat being harvested indicates that the yield may be less than heretofore estimated, and recent rains have tended to injure the cotton crop.

**Transformers.**—Sales of equipment for customer substations were exceptionally good last week. Distribution transformers are selling in better amounts throughout the entire territory.

**Cable and Wire.**—Cable demand maintains strength and deliveries are becoming longer, three months being required on certain grades of high tension cables. No. 14 rubber-covered wire is quite active at $6 to $6.25 per 1,000 ft. The industrials are entering the market for the larger sizes of rubber-covered, on which representative prices are: No. 12, $9.75 per 1,000 ft.; No. 10, $12.50 per 1,000 ft., and No. 8, $15.74 per 1,000 ft.

**Sockets.**—Demand for the week was off because of the holidays, but average daily sales show improvement as the new houses of this season near completion. Stocks are conservative but complete. Representative prices are: Key, $18.15 per 100; keyless, $16.50 per 100; pull, $33 per 100; all in standard package lots.

## San Francisco

**Present Conduit Market Slow—Bushings and Locknuts Hold Steady—Radiator Demand Brisk**

Building is booming. The value of building permits issued in June, 1922, in San Francisco, was $3,336,701 and in Oakland, $3,381,045. The corresponding figures for June, 1921, were $950,965 and $1,486,022, respectively.

**Conduit**—Nearly all big jobs have been billed and shipped. With the exception of two or three scattering carloads, comparatively little bulk business is in sight. The larger proportion of dwellings means that while the value of permits is high the amount of conduit demanded is comparatively small. There are, however, some exceedingly good school and apartment house jobs in sight.

Present prices on $\frac{1}{2}$-in. galvanized run about $6.20 per 100 ft.; on black conduit, about $5.95 per 100 ft. Local stocks are good.

**Bushings and Locknuts.**—One-half inch bushings are quoted in any quantity at approximately $1.25 per 100; 1-in. at $3.25 per 100; $\frac{1}{2}$-in. locknuts are quoted at 55 cents per 100; and 1-in., $1.25 per 100.

**Boxes and Covers.**—The market is quiet and gathering itself, it is said, for another advance in the latter part of the month.

**Flexible Conduit.**—Flexible metallic conduit is selling several hundred per cent better than this time last year. Local regulations prohibiting the use of flexible conductors are helping the demand for the small sizes of flexible conduit but the fact remains that more and more of the larger sizes are being specified. Jobbers' stocks are in fair shape.

**Radiators.**—A leading manufacturer reports that actual orders and advance orders now compare favorably with the business that was done in 1920. Prices remain as last year, with the standard single burner type listing at $10.50 each.

## Salt Lake City

**Satisfactory Fan Sales—Ranges Moving Well—Good Demand for Grills—Vacuum Cleaner Sales Slump**

Some idea of the impetus in the building industry can be gained from the fact that June contracts for 1922 were more than double the total for June of 1921. In Salt Lake City in June a year ago there were ninety-two permits for new construction and forty permits for alterations with a cost of $244,614.50. In June of this year, there were 143 new building permits and thirty-five for alterations totaling $738,737.

Except for the strikers who are voluntarily idle, there is little unemployment in this territory.

Crop prospects continue good, with no serious untoward weather conditions. The fruit crop is moving to a good market. The canning industry is producing at a better rate than it has in several years.

With the fan season at its height, sales are reported only satisfactory.

Electric ranges are moving well.

**Grills.**—Standard price on single plate grills is around $12.50, call for them is good and stocks are in ample supply.

**Vacuum Cleaners.** — Sales have slumped considerably since the close of the spring and early summer campaign.

## Portland—Seattle

**Rubber-Covered Wire Market Steady—Great Activity in Electric Ranges—Improved Collections**

General business conditions are not as satisfactory as desired for this time of year. Electrical jobbers, however, state that business is continuing to hold its own, and in many cases is appreciably improved. Greatest activity at the present time appears to be in full line equipment and electric ranges. No changes of any importance are reported for the week. Collections are materially improved.

**Rubber Covered Wire.**—No. 14 rubber-covered wire is quoted at $6.75 and No. 12 at $9.10 per 1,000 ft. in 5,000 ft. lots.

**Weatherproof Wire.** — Triple-braid weatherproof wire in sizes No. 8 to No. 0000 is quoted at $20.50 per 100 lt. in 500-lb. quantities.

**Lamp Cord.**—No. 18 cotton-covered lamp cord is quoted at $14.05 and No. 18 P. and S., at $20.30 per 1,000 ft. in coil lots of 250 ft.

**Sockets.**—Quotations on brass shell sockets are as follows: Key, $24.75; keyless, $22.50, and pull chain, at $45 per 100 in cartons of twenty-five.

# Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

### Fixture Manufacturers and Dealers to Co-operate

For the purpose of co-operation, arrangements have been made by the Executive Board of the Lighting Fixture Dealers' Society of America and the officials of the National Council of Lighting Fixture Manufacturers to join together more closely in discussions regarding promotion of their activities and solution of their problems.

According to Charles H. Hofrichter, secretary of the National Council of Lighting Fixture Manufacturers, the affairs of both organizations will be administered from the same office. Each organization will maintain its own identity, have its own officers, collect and handle its own funds and in every way conduct the detailed work of the organization in an individual manner.

### Security Electric Increases Capacity

By changing quarters from 1463 West Ohio Street to 2635 Canton Street, Chicago, the Security Electric Manufacturing Company increased manufacturing floor space 250 per cent. H. Ostermann, general manager, stated that the better manufacturing facilities afforded in this new location was the main reason for this change, since the heating appliance business for the first six months of 1922 ran over three times the volume transacted in 1921. No organization changes accompanied this removal.

### Chambersburg Power Plant Orders New Equipment

Extension of the plant of the Chambersburg Electric Light Company at Chambersburg, Pa., has been necessitated through the increased demand for electric power. The equipment, consisting of a 1,000-kw. turbine generator unit, for the proposed extension has been ordered by the city of Chambersburg from the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The projected extension of the Chambersburg municipal power plant is being made under the direction of A. C. Wood of Philadelphia, consulting engineer.

### General Electric to Build Warehouse at Atlanta

Construction will start soon on a four story reinforced concrete warehouse for the General Electric Company in Atlanta. Plans were made so that the building may be doubled in size in the future. In addition to the main warehouse there will be a one-story building adjoining which will be used as a service station and repair shop for General Electric equipment. It is estimated that the cost of this building will be between $150,000 and $200,000, and it is expected to be completed by Jan. 1, 1923.

The General Electric Company's southeastern office will remain in its present location in the Citizens & Southern Bank Building.

### St. Louis Fair Market for Converter Substations

Converter substations will form a large portion of the electrical apparatus sales in St. Louis this year. The United Railways Company has announced plans for the installation of five new automatic stations, two to be rated at 1,000 kilowatts each and three at 2,000 kilowatts each. The Union Electric Light & Power Company is now installing a 2,000 converter station to serve the down-town light and power load.

In addition, the Union Electric Company will build this year two transformer stations for distribution purposes in the residential districts.

### Electric Furnace Company Closes Large Foreign Contracts

Two large foreign contracts have just been closed by the Electric Furnace Company, Salem, Ohio. The first calls for an aluminum melting furnace for Germany, and the second for a set of automatic heat treating units for Japan.

The United Aluminum Works, Lautewerke, Germany, has contracted for a 200-kw. tapping type electric furnace capable of holding 4,000 lb. of aluminum. This company is turning to electric melting as the one sure method of producing clean bright aluminum, free from gas occlusions.

Mitsui & Company, New York City, have purchased, for shipment to Japan, a complete automatic set for heat treating forgings. The hardening furnace will be rated at 80 kw. and will contain five rows along which the forgings will advance. The only manual operation will be the periodic placing of materials before the pusher of this furnace. Automatic arms will advance the material through the quench and 40-kw. drawing furnace. Time clock mechanism will control the operation and prevent any piece advancing before it has received exactly the treatment specified.

Two new Baily furnaces are also going into operation at the Port Huron plant of the American Bushings Corporation. The first is a 105-kw. brass melting furnace of 1,500-lb. capacity. The second is a 60-kw. annealing furnace for bronze bushings. This furnace has a magazine feed and contains eleven rows for advancing the bushings down to eleven discharge tubes, treating the product at the rate of one bushing every three seconds.

P. & F. Corbin, New Britain, Conn., have added another Baily to their brass melting battery. The new furnace pours the metal directly into the molds. It is rated at 75 kw. with 800-lb. hearth capacity.

### Ford Plans Electrical and Mechanical Engineering Laboratory

All mechanical and electrical engineering activities of the Henry Ford enterprises will be housed under one roof in Dearborn, Mich., it has been announced. A one-story laboratory, 800 x 200 ft., will replace thirteen temporary structures built during the war. It will cost $500,000.

Reports that all Ford office staffs about Detroit would be centralized in Dearborn were denied by Mr. Ford. He also declared that the erection of the laboratory does not mean that a great force of workmen would be taken to Dearborn.

He confirmed the report that in a short time the Lincoln Motor Car Company would be receiving its electric power from the River Rouge plant by means of underground wires, nearly all of which are now in place.

## W.E. Creed Announces Formation of Large Steel Corporation

Wiggington E. Creed, president of the Pacific Gas & Electric Company and of the Columbia Steel Company, San Francisco, Cal., has announced that a new $15,000,000 corporation will soon start to build up the steel industry for the West. The new concern, to be known as the Columbia Steel Corporation, has acquired the coal properties of the Utah Coal & Coke Company in Carbon County and vast iron deposits in Iron County, Utah, as well as the Portland, Ore., steel foundry and the California steel foundry and rolling mill of the Columbia Steel Company.

In San Francisco Mr. Creed is associated in the enterprise with J. D. Grant, A. M. Clark, D. H. Botchford, A. E. Boynton, Joseph Sloss, W. P. Hammon, John S. Drum, Herbert Fleishhaker, Mortimer Fleishhaker and Alfred Esberg. These men represent some of the most important industrial as well as financial institutions in the West and bring to the corporation their strong faith in the important destiny of the undertaking.

In his statement Mr. Creed said:

"The Columbia Steel Company has acquired the coal properties of the Utah Coal & Coke Company in Carbon County and extensive iron properties in Iron County, Utah. The purchase will be effected through the organization of a new corporation to take over the rolling mills and steel foundries of the Columbia Steel Company and the assets of the Utah Coal & Coke Company. An intensive investigation, extending over a period of more than eight months, has demonstrated that the Utah coal and iron properties can be used to form the basis of an independent steel industry for the Pacific coast and mountain territory. Definite plans have not been matured except to the point of effecting the purchase and consolidation, but the program for future developments is now being worked out.

## McGraw Company and Central Telephone Consolidate

Plans for the consolidation of the McGraw Company, Omaha, Neb., and Sioux City, Iowa, with the Central Telephone & Electric Company have been completed, it was announced by officials of the McGraw Company on July 1.

The consolidated company will be known as the McGraw Company, the adoption of this name being decided upon to shorten the name and because the volume of telephone business is now so small a part of the total business. Both companies have for years handled practically the same lines, among the most important being the Westinghouse agency. No change in its distributing agencies will be made.

With this consolidation, the McGraw Company becomes one of the largest and strongest wholesale electrical distributors in the United States. F. D. Phillips becomes vice-president of the McGraw Company and will remain in charge at St. Louis. William Saltmarsh, secretary and purchasing agent of the McGraw Company, will move to St. Louis, which will be the largest point at which the company is located.

## Screw-Thread Standardization Reports Submitted

Reports were submitted to the National Screw-Thread Commission on July 7 by the sub-committees dealing with threads on electric fixtures and fittings, standardization and unification of screw threads, and with bolt-heads, nuts and wrenches. Pending certain detailed additions and changes, the reports will not be made public but it is expected that they will be ready for inspection by anyone interested within the next few days. The sub-committees expect to hold their next meeting the second week in August. The next meeting of the Screw-Thread Commission probably will be held in New York the second week in September.

## Westinghouse Company Makes Important Changes

The business of the Pittsburgh High Voltage Insulator Company will be carried on in the future under the name of the Westinghouse High Voltage Insulator Company, according to announcement made by C. M. Semler, general manager. The change in name, which was made by vote of the company's stockholders, does not affect the management or method of conducting the business of the company, which will be carried on as it has been in the past, according to the announcement made.

Owing to the large increase in its business in Mexico the Westinghouse Electric International Company recently extended its offices in Mexico City, Mex. These offices are situated in the Boker Building, Isabel la Catolica and 16 de Septiembre Streets, which is one of the handsomest office buildings in the city.

Five large rooms are now used by the Westinghouse Company and three others are available for future extensions. All the offices are equipped in American style and business is conducted according to American methods. In addition to these offices, the Westinghouse Company also maintains a large warehouse on the outskirts of Mexico City, where quantities of stock are kept on hand at all times for the demand of the trade.

Increased business in the Argentine has resulted in the Westinghouse Electric International Company moving into larger offices. The new address of the company is Cia. Westinghouse Electric Internacional, S. A., Avenida De Mayo 1031, Buenos Aires, Argentina. Louis T. Peck is managing director of the Buenos Aires branch.

## Nathaniel Baldwin Company Incorporated for $1,000,000

Nathaniel Baldwin, inventor of the Baldwin radio receiver and amplifier, has incorporated a new $1,000,000 company to be known as Nathaniel Baldwin, Incorporated, for the manufacture of radio apparatus. Associated with Mr. Baldwin in the company are David Neff, vice-president and treasurer; Lawrence Clayton, secretary; Seth Chamberlain, Ray Andrus, L. P. Fisher and Loren Wooley.

It will be the purpose of the company to increase its plant facilities to a considerable extent, to enlarge the output of receivers and amplifiers, and generally to endeavor to promote the manufacture and sale of Mr. Baldwin's inventions.

**The Bureau of Mines** has allotted $16,240 of its new appropriation for studies of the use of electricity in mining operations.

**The Westinghouse Lamp Company**, Watsessing, Bloomfield, N. J., is increasing operations and adding to the working force.

**The Benjamin Electric Manufacturing Company**, Chicago, Ill., is disposing of a bond issue of $1,500,000.

**Electric Power from Lignite.**—By utilizing several existing mines in the Province of Teruel, Spain, a British owned company has undertaken the production of electric power from lignite. The mines are located in the coal basin known as Castellote, about 50 km. from Alcaniz.

**The Mechanical Appliance Company** has changed its name to the Louis Allis Company, officials of that company announce. According to Louis Allis, president, "The company is earnestly striving to come closer to standards of excellence and integrity which long since have been set as a pledge which the name Allis implies."

**The United States Light & Heat Corporation**, Niagara Falls, N. Y., is perfecting plans for the immediate establishment of a branch plant at Oakland, Cal., to provide for Pacific Coast trade. A site and building have been selected. The branch will be in charge of George F. Wray, Pacific Coast sales agent, and B. F. Bradley, formerly situated at the main works. Operations at the new branch will include a full line of batteries, lighting and starting equipment, etc.

**The Horn & Brannen Manufacturing Company**, 427 Broad Street, Philadelphia, manufacturer of electric fixtures, has purchased property, 84 x 208 ft., at 1814-1816 Spring Garden Street, for about $100,000. A new manufacturing building will be erected on a portion of the site.

**The Rome Wire Company**, Rome, N. Y., announces that it has taken an interest in the Atlantic Insulated Wire & Cable Company, which will continue to manufacture rubber-covered wires and cables.

## Foreign Trade Notes

PROPOSED ELECTRICAL DISTRIBUTION FOR BALLARAT, AUSTRALIA.—The Electric Supply Company, Victoria, Australia, the *Electrician* states, has submitted a proposal for the distribution of electricity supplied from the Morwell coal fields in Ballarat and adjacent districts, provided the municipalities will provide the funds required for converting plant and mains, and also if an extension of its recent lease be granted.

EXPOSITION OF MECHANICAL AND ELECTRICAL INDUSTRIES IN GHENT, BELGIUM.—An international exposition of mechanical and electrical industries, *Commerce Reports* states, will be held at Ghent, Belgium, from June 1 to Oct. 1, 1923. The exposition will be held in the former buildings of the Ghent World's Exposition of 1913. The classes of goods to be exhibited will include mechanical plants and processes, metallurgy and mining, machine tools, electrical equipment and appliances, transport accessories, etc. Requests for information in regard to the exposition may be addressed to Comité de l'Exposition de 1923, Royal Casino, Paic, Ghent, Belgium.

PROPOSED ELECTRIC PLANT FOR CARTAGENA, COLOMBIA, S. A.—The Cartagena Water Works, according to *Commerce Reports*, has submitted a proposal to the city government for the construction of an electric light plant in connection with the proposed reservoir for securing a water supply for the city.

HYDRO-ELECTRIC EXTENSION IN JAPAN.—Arrangements have been made, according to *Commerce Reports*, for increasing the capital of the Inawashiro Hydro-Electric Supply Company from 21,000,000 yen to 40,000,000 yen, the proceeds to be used for construction of new plants.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A hotel corporation in Madeira (No. 2,720) desires to purchase electric table lamps for restaurant and night tables, electric self-winding clocks, etc.

A company in England (No. 2,749) desires to purchase radio-phone apparatus, installations for radio telephone messages and accessories.

A merchant in Norway (No. 2,770) desires to secure an agency for the sale of railway supplies and electrical material.

A merchant in Greece (No. 2,851) wishes to purchase pocket electric lamps, etc.

A merchant and manufacturer in Spain (No. 2,868) desires to purchase and secure an agency for automatic and electric pianos, etc.

RECONSTRUCTION OF BURNED DISTRICTS OF CORK, IRELAND.—Plans are rapidly maturing, according to *Commerce Reports*, for the reconstruction of those parts of the city of Cork, Ireland, which were destroyed by fire on December 11 and 12, 1920. Among the materials required are: Iron and steel (structural and reinforcing materials), general hardware, elevators, electrical equipment and wiring supplies, etc. The Bureau of Foreign and Domestic Commerce is in receipt of the following lists, which may be obtained by referring to BE-3006-Building trades in Cork, including plumbers, architects, electrical engineers, contractors, etc.

## New Apparatus and Publications

INSULATING MATERIALS.—The Garfield (N. J.) Manufacturing Company is distributing a sixteen-page pamphlet describing its various types of insulating material, including "Gummon," "Tegit" and "Hemit," for use in connection with the electrical industry.

GLUE POT.—A glue pot with a rheostat control which permits an almost unlimited variation in temperature has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

SAFETY SWITCHES.—The James E. Gleason Company, 650 West Monroe Street, Chicago, is distributing bulletin S-2, describing its safety switches, panel boards and outlet cabinets.

SMALL STEAM TURBINE.—The De Laval Steam Turbine Company, Trenton, N. J., has recently placed on the market a small steam turbine for driving power plant auxiliaries, including exciters, circulating pumps, etc.

ELECTRIC FURNACES AND BOILERS.—The Electric Furnace Construction Company, 908 Chestnut Street, Philadelphia, has issued two new catalogs, one describing various types of electric furnaces for melting, refining and superheating of iron and steel, and particularly a new feature of the "Graves-Etchells" steel melting furnace. The other describes the "Electro" steam boiler developed by F. T. Kaelin, chief engineer of the Shawinigan Water Power Company, Canada, and developed in the United States by the Electric Furnace Company.

TESTING INSTRUMENT.—A new armature-testing instrument, "Chapman Armeter," for instantaneous testing of armatures and commutators, has recently been developed by the P. E. Chapman Electrical Works, Tenth and Walnut Streets, St. Louis.

TURBINES.—The Pelton Water Wheel Company, Nineteenth and Harrison Streets, San Francisco, is distributing a sixteen-page booklet entitled "The Kern River No. 3 Plant of the Southern California Edison Company." Attention is called to the prime-mover equipment, consisting of two 25,000-hp. Pelton vertical turbines operating under a head of 810 ft., and other novel features of the design of both turbines and accessory apparatus.

WASHING MACHINE.—"It Will Save Your Hands Too" is the title of a four-page leaflet distributed by the Laundryette Manufacturing Company, 1190 East 152nd Street, Cleveland, describing the "Laun-Dry-Ette" electric washing and drying machine.

SWITCHES.—"Get the Most Out of Electricity in the Home" is the title of a small folder distributed by the Beaver Machine & Tool Company, Inc., 625 North Third Street, Newark, N. J., covering the "Beaver" controlling switches for household electrical appliances.

NICKEL.—The American Nickel Corporation, Clearfield, Pa., is distributing bulletin No. 101 entitled "Pure Malleable Nickel," which describes the "American Nickel," its properties and uses.

METER BOX.—The Safety Meter Box Company, Erie Building, Cleveland, is distributing a leaflet describing its safety meter box.

RADIO RHEOSTAT.—The Cutler-Hammer Manufacturing Company, Milwaukee, will soon place on the market its new "C-H" vacuum-tube rheostat for radio use. It will be furnished in two styles, one with vernier adjustment for control of detector tubes, or without vernier for control of amplifier tubes.

MILLING MACHINE.—Bulletin No. 58 issued by the Newton Machine Tool Works, Inc., Twenty-third and Vine Streets, Philadelphia, describes and illustrates the "Newton" continuous milling machine. The company is also distributing bulletin No. 57, covering its radius link-grinding machine.

DIMMERS.—The Ward Leonard Electric Company, 31-41 South Street, Mount Vernon, N. Y., is distributing a leaflet showing several views of a switchboard pre-set installation of Ward Leonard "Vitrohm" dimmers.

## New Incorporations

THE WILLOW RIVER POWER COMPANY, Hudson, Wis., has been incorporated by F. P. Buckhardt, A. P. Schultz and B. A. Buckhardt, all of Hudson. The company is capitalized at $500,000 and proposes to construct and operate hydro-electric and steam generating plants and distributing and transmission systems.

THE LUSK (WIS.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $25,000 by P. M., A. K. and O. L. Pederson, all of Lusk, to construct and operate hydro-electric generating plants and to furnish electricity for lamps and motors.

THE CAPROCK LIGHT & POWER COMPANY, Crosbyton, Tex., has been incorporated with a capital stock of $40,000 by S. A. Guy, J. C. Orr and E. H. Wheat.

THE FOLEY (ALA.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $30,000.

# Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

## New England States

ATTLEBORO, MASS.—A one-story power house will be erected at the Sturdy Memorial Hospital. The R. D. Kimball Company, 6 Beacon Street, Boston, is consulting engineer.

CAMBRIDGE, MASS.—Preliminary work has started on the removal of overhead electric wires from the streets in Cambridge and placing them underground. Under the present arrangements two miles of streets will be cleared each year.

LEE, MASS.—The Lee Electric Company is planning to erect a large transformer station near its Canal Street yard, which will be equipped with six large outdoor type transformers. The company will also install a static condenser at the Tayford plant in East Lee, to cost about $4,500.

PITTSFIELD, MASS.—The Pittsfield Electric Company has petitioned the Board of Aldermen for permission to erect a transmission line to connect with the transmission system of the Turners Falls Power & Electric Company, Turners Falls.

NEW HAVEN, CONN.—The United Illuminating Company has acquired a site on Ferry Street, near Middletown Avenue, on which it will erect a substation.

WATERBURY, CONN.—The construction of another large dam on the Housatonic River in the vicinity of West Cornwell and Lime Brook is reported to be under consideration by the Connecticut Light & Power Company.

## Middle Atlantic States

ELMSFORD, N. Y.—Motors, electric power equipment, conveying machinery, etc., will be installed in the proposed plant to be erected at Elmsford by the Horace L. Day Company, 4 White Street, New York City, to cost about $250,000.

HOLLAND, N. Y.—The Depew & Lancaster Light & Power Company, Lancaster, has been granted permission by the Public Service Commission to build a transmission line to Holland and install a local distributing system.

LOCKPORT, N. Y.—Plans are under consideration for the installation of a new ornamental lighting system in the business district, to cost about $4,000. The plans call for 72 magnetite arc lamps.

MT. VERNON, N. Y.—The Westchester Lighting Company is preparing plans for the construction of a two-story service building and meter shop on East Seventh Street, to cost about $250,000, with equipment. William C. Morris, 130 West Fifteenth Street, New York, is architect.

NEW YORK, N. Y.—The American Smelting & Refining Company, 120 Broadway, will build a power plant in connection with its proposed byproduct coke plant in the Coahuila district, Mexico, to cost about $5,000,000.

NEW YORK, N. Y.—Plans have been approved by the Cities Service Company involving an expenditure of several million dollars on the properties of the Ohio Public Service Company, a subsidiary, serving the northeastern section of Ohio, and which include the erection of a 60-mile, 130,000-volt transmission line from Lorain to Mansfield, Ohio; a similar line between Warren, Alliance and Canton (55 miles), where it will tie in with the system of the American Gas & Electric Company. Also for the installation of a 20,000-kw. turbine at the Edgewater plant at Lorain, and a 30,000-kw. turbine at the Toledo (Ohio) Edison Company's plant. A new 10,000-kw. turbo-generator has been authorized for the plant of the Empire District Electric Company, Joplin, Mo., together with other equipment for subsidiary utility properties of the Cities Service Company, calling for an additional $1,000,000.

DOVER, N. J.—The New Jersey Power & Light Company is preparing to extend its transmission lines from Broadway to Hackettstown.

MILFORD, N. J.—The Warren Manufacturing Company, which furnishes electricity to operate the municipal light and

power plant, will build a new line to supply electricity to the mill of the Ingham & Tirrell Silk Company.

PASSAIC, N. J.—A power house will be installed in connection with a proposed five-story addition to the St. Mary's Hospital, to cost about $300,000. Crow, Lewis & Wick, 200 Fifth Avenue, New York City, are architects and engineers.

PATERSON, N. J.—The Board of Public Works has granted the Main Street Business Men's Association permission to install an ornamental street lighting system on Main Street, to cost about $30,000.

FAYETTE CITY, PA.—The H. C. Frick Coke Company, Pittsburgh, will construct an underground electric railway system in connection with a new coal-loading harbor to be constructed on the Monongahela River.

HARRISBURG, PA.—The Western Union Telegraph Company, 195 Broadway, New York, is completing plans for the construction of a service building in Harrisburg, to cost about $40,000. Stone & Webster, 147 Milk Street, Boston, are architects.

LEBANON, PA.—Plans are under consideration for the installation of an ornamental street-lighting system on Cumberland Street, from Sixth to Ninth Street.

PHILADELPHIA, PA.—Horace T. Potts & Company, 316 North Third Street, will build a power house at their new iron and steel works at East Erie Avenue and D Street. The entire plant will cost $500,000.

PITTSBURGH, PA.—Local interests are organizing the Coraopolis Electric Company, to construct and operate a plant and system in the vicinity of Coraopolis. Application for a charter will be made at once. The company is represented by A. W. Robertson and J. R. McNary, 435 Sixth Avenue.

PITTSBURGH, PA. — The Pittsburgh Railways Company contemplates extensions to its system including additions to substation, erection of new feeder lines and underground conduits and the installation of additional equipment, to cost about $1,000,000.

SUNBURY, PA.—Bids will soon be asked for the construction of a one and two-story power house at Mark M. Packer Hospital. W. H. Rockefeller, Sunbury, is architect.

WILKES-BARRE, PA. — The Wilkes-Barre Company has issued $102,000 in bonds, part of the proceeds to be used for extensions and improvements.

BALTIMORE, MD.—The Board of Estimate has approved an appropriation of $10,000, for the purchase of underground cable, for the fire alarm system. Charles F. Goob is chief engineer of the Electrical Commission.

BALTIMORE, MD.—The power plant of the Baltimore & Ohio Railroad Company was destroyed by fire, July 4, with the grain elevator and pier at Locust Point, causing a loss of about $4,000,000.

BALTIMORE, MD. — The proposed six-story municipal warehouse and pier to be built at Locust Point by the Port Development Commission, Baltimore, to cost about $3,000,000, will be equipped with electric loading and unloading machinery, industrial trucks, conveying equipment, etc.

HAGERSTOWN, MD. — The American Water Works & Electric Company, New York, has acquired the Potomac Public Service Company, formerly known as the Hagerstown & Frederick Railway Company. Extensions and improvements will be made to the power plant and system.

RONCEVERTE, W. VA.—The West Penn Power Company, Pittsburgh, will soon take bids for the construction of an addition to its local power plant, to cost about $500,000. The J. G. White Engineering Corporation, 43 Exchange Place, New York, is engineer.

NORFOLK, VA.—The Virginian Railway Company plans the construction of an electrically-operated coaling pier at Sewell's Point, to cost about $3,000,000, including power equipment, etc.

PORTSMOUTH, VA. — The Council is considering improvements to the lighting system on upper High Street.

WASHINGTON, D. C. — The Board of District Commissioners is considering the erection of a one-story power house, 50 x 120 ft., at the Gallinger Hospital.

## North Central States

NORTH MUSKEGON, MICH.—An electrically-operated pumping plant will be installed in connection with the proposed new waterworks, to cost about $300,000.

ST. JOSEPH, MICH.—Plans are being prepared for a new power house for the Whitcomb Hotel Company. Cahill & Douglas, 217 West Water Street, Milwaukee, are engineers.

SPRINGFIELD, OHIO.—The Springfield Light, Heat & Power Company has awarded contract for extending its underground conduit system in the downtown district this year to the G. M. Gest, 277 Broadway, New York City. The cost is estimated at $175,000. Under the terms of its franchise the company is required to install 2,000 feet of underground conduit each year.

LOUISVILLE, KY.—The city of Louisville has applied to the Federal Power Commission for a preliminary permit covering a power development at the United States dam in the Ohio River at the Falls of Louisville. The dam and lock at that point have been recommended for reconstruction. Primary power to the extent of 28,000 hp., it is estimated, would be available at that point. The city plans to install a plant of 50,000 hp. capacity.

JACKSONVILLE, IND. — The Green Valley Mining Company plans rebuilding the power house at its properties, destroyed by fire, June 29, with loss of about $50,000.

WHITEHALL, ILL.—Bids will soon be asked for extensions and improvements to the municipal power plant, to cost about $75,000. The Caldwell Engineering Company, Ayers Bank Building, Jacksonville, is engineer.

HUDSON, WIS. — The Willow River Power Company, recently incorporated with a capital stock of $500,000, is planning to build an extensive hydro-electric project on the St. Croix River and the Willow River branch. F. P. Buckhardt, A. P. Schultz and B. A. Buckhardt, all of Hudson, are interested in the project.

RICE LAKE, WIS.—Plans are being prepared for the construction of a new power plant, electric distribution system, etc., in Rice Lake, to cost about $75,000. J. H. A. Brahtz, Metropolitan Opera House Building, St. Paul, is engineer.

TOMAHAWK, WIS.—The property and holdings of the Tomahawk Light, Telephone & Improvement Company have been purchased by the Wisconsin Valley Electric Company, Wausau. Plans are being prepared by the Wisconsin Valley Company to develop the water power at Grandfather Dam (a 67-ft. head) on the Wisconsin River, between Tomahawk and Merrill, at a cost of about $200,000. The company also contemplates extending its high-tension transmission line from Merrill to Tomahawk.

WEST BEND, WIS. — The West Bend Aluminum Company will build a one-story addition to its power house.

MINNEAPOLIS, MINN.—The Ford Motor Company is reported to be planning the erection of a hydro-electric power plant near the high dam, in connection with proposed local automobile and tractor plant, to cost about $1,500,000.

ST. PAUL, MINN.—An electric crane, air compressors and other mechanical equipment will be installed in the new mines experiment station at the State University.

WIOTA, IOWA.—The proposal to install an electric-lighting system has been approved by the voters. Arrangements will be made to supply electricity to the farmers between Aita and Wiota. Electricity will be supplied by the Guthrie Center (Iowa) Power Company.

CARROLLTON, MO. — The property of the Water, Light & Transit Company has been acquired by the Kansas City (Mo.) Power & Light Company, including the transmission lines to Bogard, Tina, Bosworth, Wakenda, Miami Station, DeWitt, Brunswick, Glasgow, Menden, Triplett and 50 miles of rural lines in Carroll County. The Kansas City company, it is understood, will erect a high-tension transmission line from Kansas City to the local plant.

ST. LOUIS, MO. — The erection of a power plant, at the Robert Koch Hospital, to cost about $75,000, is under consideration by the Board of Aldermen.

ST. LOUIS, MO.—The Broderick & Bascom Rope Company will build a one-story power house in connection with its proposed new wire rope plant, to cost about $250,000.

CANOVA, S. D.—Plans are under consideration to install a municipal distributing system and to erect a transmission line to Spencer to secure electricity from the system of the Minnesota Electric Distributing Company, a subsidiary of the Northern States Power Company, Sioux Falls. The cost is estimated at $12,000.

WICHITA, KAN.—Electric and power equipment, conveying apparatus, hoisting machinery, etc., will be installed in the new elevator to be erected by the Victory Mill & Elevator Company.

WICHITA, KAN.—The Kansas Gas & Electric Company is reported to be interested in a project to build a large power plant on the Neosho River, east of Parsons, to cost about $1,000,000.

## Southern States

CARTHAGE, N. C.—Plans are under way by the Sandhill Power Company for the erection of a steam-driven electric plant at the mines of the Carolina Coal Company in Chatham County, as an auxiliary to the present water power plant. John R. McQueen is president of the Sandhill company.

CAMDEN, S. C.—Arrangements are being made by the Palmetto Power & Light & Power Company to erect a transmission line from the dam of the Wateree Power Company to Camden, a distance of 9 miles. The Palmetto company has a contract to furnish electricity to the local municipal electric plant and to the Wateree mills for a period of five years.

AUGUSTA, GA.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until July 26, for lighting fixtures in the United States Public Building here.

MEMPHIS, TENN. — Plans are being prepared by the Dixie Power Company for a hydro-electric plant on the White River, to cost including machinery and transmission machinery, about $750,000.

MEMPHIS, TENN.—The Clover Farm Dairy Company will build a power house at its proposed new ice cream plant, to cost about $75,000. L. M. Learned is general manager.

FOLEY, ALA.—The Foley Light & Power Company, recently organized with a capital stock of $30,000, plans to establish an electric plant in Foley.

SELMA, ALA. — The Alabama Power Company contemplates extending its transmission line from Selma to Marion.

TUSKEGEE, ALA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 21 for the installation of two push-button control electric passenger elevators, and one electric freight elevator at United States Veterans' Hospital, Tuskegee.

HOT SPRINGS, ARK. — The Missouri Lumber Co. is planning to rebuild its power house recently destroyed by fire, with other portions of the plant.

PINE BLUFF, ARK.—The Saline River Hardwood Company, it is reported, contemplates the construction of a power house in connection with remodeling its local mill. The cost is estimated at $100,000.

ADA, OKLA.—The Oklahoma Portland Cement Company will build a power plant at its local mill.

FAIRLAND, OKLA. — Contract for the construction of a municipal transmission line, to cost $13,300, has been awarded to the Peabody Electric Company, Muskogee. H. G. Olmsted & Company, Oklahoman Building, Oklahoma City, are engineers.

JEFFERSON, OKLA.—Plans are being prepared for the construction of a transmission line and distributing system for municipal service. H. G. Olmsted & Company, Oklahoma City, are engineers.

JENNINGS, OKLA.—The Oklahoma Gas & Electric Company will build a new transmission line here, and install a local distributing system. A line will also be constructed to Cleveland, Okla., and distributing system built. The municipal power plants at both places will be discontinued.

OKEMAH, OKLA.—The City has granted a ten-year light and power franchise to the Oklahoma Power Company, which will build a transmission line at once. Heretofore service has been rendered by a municipal plant, which, it is understood, will be abandoned.

CURRIE, TEX.—A company has been formed to take over and operate the power plant of the Currie Electric Company. The plant will be enlarged and machinery installed to double the present capacity. T. H. Williams and H. P. Tate head the new company.

DALLAS, TEX.—The Dallas Power & Light Company will rebuild its transformer station on Griffin Street, damaged by fire, June 27, causing a loss of about $60,000.

DENISON, TEX.—The Missouri, Kansas & Texas Railroad Company, Railway Exchange Building, St. Louis, will build a power house in connection with new shops and yards here, to cost about $400,000. A. L. Sparks is architect for the company.

FORT WORTH, TEX. — The Lighting Department contemplates the installation of an ornamental street-lighting system, on Park Avenue and on other thoroughfares in North Fort Worth.

ORANGE, TEX.—The Council will install a street-lighting system on a number of streets in the North Orange district.

WACO, TEX.—The Missouri, Kansas & Texas Railroad Company, Railway Exchange Building, St. Louis, will build a one-story

power house in connection with its new car and locomotive shops here, to cost about $800,000. A. L. Sparks is architect for the company.

WELLINGTON, TEX.—An ornamental street-lighting system will be installed in the business section.

## Pacific and Mountain States

DEER PARK, WASH.—Mark F. Mendenhall, president of the Mount Spokane Power Company has petitioned the Public Service Commission for permission for a franchise to operate an electric railway between Deer Park, Clayton and Loon Lake to Springfield.

LIND, WASH.—Surveys are being made for the new Palouse 60,000-volt transmission line of the Washington Water Power Company from Lind to Colfax. A substation will be erected at Lind to step down the current from 110,000 volts to 60,000 volts.

SEATTLE, WASH. — The transmission line being erected by the Puget Sound Power & Light Company into the Wenatchee Valley by the way of Cle Elum, to furnish electricity to the Washington Coast Utilities Company, Arlington, will be completed by the summer of 1923. The line will be about 120 miles long and will cost with transforming and switching equipment about $800,000.

TACOMA, WASH. — The Council has approved an ordinance for the installation of ornamental lighting systems on North I and North Twenty-first Streets.

WALLA WALLA, WASH.—A committee has been appointed to make investigations in regard to establishing a municipal power plant.

ANTIOCH, CAL.—The city is negotiating with the Pacific Gas & Electric Company for the installation of an ornamental lighting system on Second and G Streets.

KEYES, CAL.—The Modesto and Turlock Irrigation Districts, Modesto, will construct a joint transmission line from the Don Pedro power plant to Keyes and vicinity, to cost about $300,000, with substations and transformers. Percy Jones, chief engineer, Modesto district, and R. V. Meikle, chief engineer, Turlock district, are in charge.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Company has issued $5,000,000 bonds, part of the proceeds to be used for extensions and improvements.

MODESTO, CAL. — Bids will soon be asked for the installation of ornamental lighting systems on portions of Sycamore and Morris Avenues. George Freitas is city engineer.

MODESTO, CAL. — The irrigation districts of Modesto and Turlock have voted to distribute power generated at the Don Pedro plant. Favorable action was also taken on the proposal to issue $1,000,000 in bonds to erect a power house, transmission lines and transformer stations.

SAN FRANCISCO, CAL. — The Great Western Power Company has been granted permission by the State Railroad Commission to use a fund of $1,653,073 for extensions and improvements.

PALO ALTO, CAL.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until July 27, for lighting fixtures in the United States Veterans' Hospital at Palo Alto.

SAN PEDRO, CAL. — Council has approved an ordinance for the installation of an ornamental lighting system on Sixth Street.

BASIN, WYO.—Plans are under consideration by the Midwest Refining Company, Greybull, and the city of Basin for the erection of an electric transmission line from the Cody dam to Greybull and from Greybull to Basin, a distance of 66 miles, to cost about $50,000.

LOVELAND, COL. — The Council has passed an ordinance authorizing the Mayor to advertise for bids for construction of a hydro-electric plant on the Big Thompson River in Loveland Canyon and also providing for the sale of bonds not to exceed $425,000 for its erection and maintenance.

MONTROSE, COL.—The Western Colorado Power Company has completed surveys for the erection of a new transmission line between Montrose and Ouray, a distance of 36 miles.

MORA, N. M.—The Council will install a lighting system on all streets.

SANTA FE, N. M.—The Council is considering a proposition to purchase the power plant and property of the Santa Fe Water & Light Company. If taken over by the city extensions and improvements are contemplated to the system.

# Electrical Patents

**Announced by U. S. Patent Office**

(Issued June 20, 1922)

1,420,515. CURRENT INTERRUPTER; C. E. Bennett, Atlanta, Ga. App. filed Sept. 9, 1919. Liquid lightning arrester in which the electrode touches a liquid and a lightning discharge generates steam, forcing liquid out of contact with the electrode, and breaks arc.

1,420,541. SPLICE AND SECTIONAL INSULATOR; Zack Grass, Heiner, Ky. App. filed Oct. 31, 1921. For different sizes of trolley wires with a switch attached.

1,420,561. ELECTRIC FURNACE; Knut Leander, Albany, N. Y. App. filed May 19, 1920. Body can be withdrawn from under roof.

(Issued June 27, 1922)

1,420,629. TELEDYNAMIC ORIENTATION SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed March 29, 1918. Control of bodies by wireless.

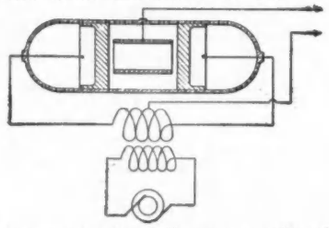
1,420,633. AUDIBLE SPEEDOMETER; J. E. Kennedy, Glens Falls, N. Y. App. filed Dec. 17, 1919. Warns driver who exceeds predetermined speed.

1,420,636. ELECTRICALLY HEATED GARMENT PRESSER; B. W. Macy, Jacksonville, Fla. App. filed Feb. 16, 1921. Heating element submerged in oil.

1,420,675. STORAGE-BATTERY TERMINAL; E. F. Andreae, Newark, N. J. App. filed Sept. 4, 1918.

1,420,687. ELECTRIC FURNACE; S. N. Castle, New Rochelle, N. Y. App. filed Aug. 13, 1918. Induction type.

1,420,692. ELECTRIC WATER HEATER AND STEAM GENERATOR; H. E. Cohen, Brooklyn, N. Y. App. filed Oct. 12, 1920. Generates small amounts of steam.



Electron tube for full wave rectification. (No. 1,420,824.)

1,420,693. ELECTRIC BOILER; H. E. Cohen, Syracuse, N. Y. App. filed March 4, 1922. Float carries heating elements.

1,420,694. SWITCH BOX; W. M. Gore, Toledo, Ohio. App. filed Jan. 12, 1920. Multiple-unit iron box for house switches.

1,420,735. WELDING MACHINE; T. E. Murray, Jr., and J. B. Murray, Brooklyn, N. Y. App. filed Feb. 1, 1921. Welding segments having flanges transverse to edges welded.

1,420,759. SUBMERGED HEATER FOR TANKS; J. G. Sawicki, Essexville, Mich. App. filed Jan. 26, 1922. Heater placed in bottom of washing machine.

1,420,761. ARRANGEMENT FOR EXCITING CONTINUOUS CURRENT GENERATORS; L. Schön, Essen, Germany. App. filed Sept. 4, 1920.

1,420,770-1,420,771. BINDING POST; O. A. Smith, Cleveland, Ohio. App. filed Aug. 2, 1919. Two patents for dry cell carbon electrode binding post.

1,420,801. ROTARY ANNUNCIATOR; F. W. Wood, Montclair, N. J. App. filed Oct. 24, 1919. Balanced vane operated by magnets.

1,420,806. LIGHTING FIXTURE; F. C. Baker, Portland, Ore. App. filed April 1, 1918. Semi-indirect unit.

1,420,817-1,420,820. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed Nov. 1, 1916. Four patents on an automatic regulator for charging set.

1,420,824. RECTIFIER; Harold P. Donle, Meriden, Conn. App. filed May 31, 1921. Utilizes two cold electrodes within a vacuum tube.

1,420,840. PORTABLE WATER HEATER; George W. Hewitt, Bakersfield, Cal. App. filed April 16, 1921. Heats small quantities of water only.

1,420,842. ELECTRICAL CONTROLLER FOR SERIES-PARALLELING; R. B. Hunter, Milwaukee, Wis. App. filed July 19, 1920. For mine locomotives operating on two voltages.

1,420,846. CONNECTION FOR ELECTRIC CONDUCTORS; A. G. Karkau, Cleveland, Ohio. App. filed July 12, 1917. Clamping screw.

1,420,858. CONTROLLING AND REGULATING APPARATUS AND SYSTEM; F. W. Meyer, Milwaukee, Wis. App. filed March 12, 1920. Electroionic valve used as corrective means on circuits.

1,420,859. TROLLEY-POLE ADJUSTER; A. Peterson, St. Louis, Mo. App. filed Sept. 29, 1919. Automatically replaces trolley wheel after dislodgement.

1,420,885. REGULATING MEANS FOR ALTERNATING-CURRENT CIRCUITS; E. R. Stoekle, Milwaukee, Wis. App. filed June 14, 1920. For constant voltage.

1,420,895. TIME-INDICATING APPARATUS; H. E. Warren, Ashland, Mass. App. filed July 21, 1920. Synchronous motor-driven secondary clocks.

1,420,896. CONTROL SYSTEM; H. E. Warren, Ashland, Mass. App. filed Oct. 2, 1920. Operating clocks on central station lines.

1,420,911. APPARATUS FOR BUILDING UP LAMINATE INSULATION AND LIKE STRUCTURES; C. W. Davis, Edgeworth, Pa. App. filed March 29, 1920. Wraps insulating material on cables.

1,420,931. KEYBOARD TAPE PERFORATOR; Edward E. Kleinschmidt, Brooklyn, N. Y. App. filed July 16, 1919. Similar to the Baudot system.

1,420,980. PROCESS OF MANUFACTURING ELECTRICAL RESISTANCE MATERIAL; F. Eichenberger, Aarau, Switzerland. App. filed Nov. 6, 1920. Made from silicon carbide, calcium carbonate, oxides of iron and graphite.

1,420,989. TELEPHONE TRANSFORMER; W. Fondiller, New York, N. Y. App. filed Nov. 15, 1917. Repeating coil for high- and low-frequency currents.

1,421,015. TELEPHONE; M. C. A. Latour, Paris, France. App. filed April 18, 1916. Laminated receiver core.

1,421,017. BATTERY CONNECTOR; G. E. Lundberg, Kewanee, Ill. App. filed Feb. 3, 1920.

1,421,041. VARIOMETER; J. S. E. Townsend, Oxford, England. App. filed Aug. 22, 1921. Two fixed and two movable coils.

1,421,069. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed Nov. 1, 1916. Control system for car-lighting generator.

1,421,084. ELECTRIC HEATING CORE; W. W. Hicks, San Francisco, Cal. App. filed Aug. 16, 1920. Non-inductive winding of heating coils.

1,421,093. FLASHLIGHT; L. C. Matson, Dunbarton, Wis. App. filed June 17, 1921. Bulb in each end of tube.

1,421,122. LAMP SOCKET; D. E. Bown, Crafton, Penn. App. filed Nov. 5, 1918. Key switch type.

1,421,157. CONTROL SYSTEM AND APPARATUS; E. M. Bouton, Wilkinsburg, Pa. App. filed May 12, 1919. Control of motor through predetermined cycle of operation.

1,421,160. CONTROLLER; J. M. Brown, Pittsburgh, Pa. App. filed Nov. 19, 1917. Controllers for automatic electrically-operated circuit breakers.

1,421,165. REGULATING SYSTEM; A. H. Candee, Pittsburgh, Pa. App. filed Aug. 26, 1918. Constant current system.

1,421,166. DRIER FOR PAPER RULING MACHINES; J. H. Cannon, Los Angeles, Cal. App. filed May 8, 1920. Radiant heat reflected onto paper.

1,421,168. CONTAINER FOR ELECTRIC WIRES; Hyman Charm, Dorchester, Mass. App. filed April 5, 1920. Usual cover plate of wire molding dispensed with.

1,421,170. CIRCUIT INTERRUPTER; L. W. Chubb, Pittsburgh, Pa. App. filed Jan. 14, 1918. For rectifiers used in railway work.

1,421,179. CONTROL SYSTEM AND SWITCH MECHANISM THEREFOR; R. E. De Camp, Wilkinsburg, Pa. App. filed Nov. 16, 1918. For motor-accelerating systems.

1,421,180. SYSTEM OF CONTROL; R. F. De Camp, Wilkinsburg, Pa. App. filed May 12, 1919. To insure proper sequence of contactor operation on motors.

1,421,185. ELECTRIC FURNACE; R. A. Driscoll, Great Falls, Mont. App. filed Dec. 5, 1919. Ore, flux and fuel fed by rotary drill.

1,421,217. ELECTRIC STORAGE BATTERY; E. Hacking, Pawtucket, R. I. App. filed May 11, 1922. Electrolyte consists of gelatinous mass containing sulphuric acid and silicate of soda permeated with oil.

1,421,229. SYSTEM OF CONTROL; R. E. Hellmund, Swissvale, Pa. App. filed June 18, 1919. Prevents overvoltage during regeneration of railway motors.

1,421,242. CONTROL SYSTEM; H. D. James, Edgewood Park, Pa. App. filed Jan. 8, 1919. Automatic control of contactors by relays.

1,421,243. CONTROL SYSTEM; H. D. James, Edgewood Park, Pa. App. filed Apr. 4, 1919. Push-button control for motors.

1,421,244. CONTROL SYSTEM; H. D. James, Edgewood Park, Pa. App. filed Nov. 4, 1918. Reversing system operated by relays.